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PROCEEDINGS

OF THE

TWENTY-FOURTH ANNUAL CONVENTION

OF THE

Association of Colleges and Preparatory Schools of the Middle States and Maryland

1910

HELD UNDER THE AUSPICES OF

LEHIGH UNIVERSITY, SOUTH BETHLEHEM, PENNSYLVANIA

FRIDAY AND SATURDAY, NOVEMBER 25th and 26th, 1910

PUBLISHED BY THE ASSOCIATION

1911

NOTICE

Extra copies of the Proceedings of the Association may be secured without charge from the Secretary by any officer of a College or School holding membership in the Association.

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The next convention of the Association will be held on December 1st and 2nd, 1911.

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OFFICERS OF THE ASSOCIATION, 1910-1911

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TWENTY-FOURTH ANNUAL CONVENTION

HELD UNDER THE AUSPICES OF LEHIGH UNIVERSITY, SOUTH BETHLEHEM, PA.,
NOVEMBER 25-26, 1910.

SUMMARY OF SESSIONS

First Session, Friday, November 25, at 10.30 A. M., in the College Chapel and in Drown Memorial Hall at Lehigh University.

Address of Welcome:
President HENRY S. DRINKER, Lehigh University.

Response:
President JAMES M. GREEN, New Jersey State Normal School at Trenton.

Mathematics

Mathematics for Training and Culture:
Professor WILLIAM H. METZLER, Syracuse University.

The Cultural Value of Mathematics:
Professor WILLIAM WEIDMAN LANDIS, Dickinson College.

Some Astronomical Problems and the Mathematics Involved:
Professor ROBERT WOODWORTH PRENTISS, Rutgers College.

Mathematics for Engineering Students:
Professor ARTHUR M. GREENE, JR., Rensselaer Polytechnic Institute.

General Discussion:
Mr. FLETCHER DURELL, Lawrenceville School, Lawrenceville, N. J.

Second Session, Friday, November 25, at 2.30 P. M., in Drown Memorial Hall.

Science

Physics from the College Point of View:
Professor WILLIAM S. FRANKLIN, Lehigh University.

The Purpose of an Introduction Course in Botany:
Director C. STUART GAGER, Brooklyn Botanic Garden.

The Culture Element in Biology Teaching:
Mr. HENRY R. LINVILLE, Jamaica High School.

General Discussion:
MISS EMMELINE MOORE, New Jersey State Normal School at Trenton.

Professor WILLIAM S. FRANKLIN, Lehigh University.
Principal FRANCIS N. MAXFIELD, Germantown Friends' School.
Director C. STUART GAGER, Brooklyn Botanic Garden.
Professor JOHN M. MECHLIN, Lafayette College.
Dr. JAMES M. GREEN, New Jersey State Normal School.

Third Session, Friday, November 25, at 8 P. M., in the College Chapel.

President's Address: "Educational Economics."
Dr. JAMES M. GREEN, New Jersey State Normal School.
Reception tendered by the Faculty of Lehigh University in Drown Memorial Hall.

Fourth Session, Saturday, November 26, at 10 A. M., in Drown Memorial Hall.

Memorial Resolution on the Death of John B. Keiffer.

English

Practical Ways of Teaching Literature:
Professor JOHN ERSKINE, Columbia University.
The Lesson Assignment in English:
Mr. ELMER JAMES BAILEY, Cornell University.
General Discussion:
MISS MARGARET COULT, Newark High School, Newark, N. J.
Professor JOHN ERSKINE, Columbia University, New York City.
Principal W. D. LEWIS, William Penn High School, Philadelphia.
Professor ARTHUR H. QUINN, University of Pennsylvania, Philadelphia.
Professor GEORGE P. BRISTOL, Cornell University, Ithaca, N. Y.
MR. WALTER P. LEIGHTON, Lehigh University.
MISS MARGARET COULT, Newark High School, Newark, N. J.
Professor CHARLES K. MESCHTER, Lehigh University.
Professor LOUIS BEVIER, JR., Rutger's College, New Brunswick, N. J.

12. M. Business Meeting and Election of Officers.

PROCEEDINGS

OF THE

Twenty-fourth Annual Convention

FIRST SESSION,

Friday, November 25, at 10.30 A. M.

President JAMES M. GREEN, Presiding.

ADDRESS OF WELCOME

BY PRESIDENT HENRY STURGIS DRINKER, LEHIGH UNIVERSITY.

It is my privilege to welcome the Association to Lehigh. I assure you of a very genuine and warm welcome from us all, and during your stay Lehigh is yours, and all that Lehigh contains—our homes, our hands, and our hearts. We shall strive to so win you to us that when you leave us, we may feel that you leave with us your regard, and a kindly remembrance as friends, that shall endure.

You will naturally wish to know something of the surroundings into which you have ventured, and perhaps a short summary of what Lehigh to-day stands for, may be appropriate.

Lehigh University was founded in 1866. The first class matriculated in that year. It is said, and I believe correctly, that the donations of Asa Packer in founding this institution, were, up to that time, the largest that had been given by any individual to the cause of education. He set the pace subsequently followed in an increasing ratio by the other liberal and large-minded men, who have made the last forty years notable in the record of the sums given for the promotion of liberal and of technical education in our country.

Lehigh started with Schools of 1. General Literature (now Arts and Science); 2. Civil Engineering; 3. Mechanical Engineering; 4. Mining and Metallurgy; 5. Analytical Chemistry.

To-day the University offers courses of instruction in

1. Arts and Science (including courses in Business Administration and in Pedagogy).
2. Civil Engineering.
3. Mechanical Engineering.
4. Metallurgical Engineering.
5. Electrometallurgy.
6. Mining Engineering.
7. Electrical Engineering.
8. Chemistry.
9. Chemical Engineering.

It will be observed that our courses in Arts and Science head the above list. It is becoming more and more recognized by engineers that a substantial foundation of study and culture in the liberal arts is advisable for the modern engineer. This University has long recognized the advantage of a broader education for a professional man than is possible within the limitations of a technical course proper, and we have found it possible and advantageous by systematically combining the studies of the several engineering schools with those peculiar to courses in Arts and Science, to offer six year courses leading to the degree of Bachelor of Arts, or Bachelor of Science, and also an engineering degree. I think I am right in the assumption that my predecessor in office, Dr. Drown, a man of high culture, a great chemist, and a notable teacher, was a pioneer, as he was an enthusiast, in the advocacy of this combined system. You, however, as teachers, recognize the difficulty of persuading our American youth to devote this length of time (six years) to college work—the large majority of our students prefer the four-year course, with its necessary limitation to purely technical study, when working for an engineering degree.

It seems to me that the teachers of the country have no higher or greater duty than to impress on our young men the advisability of a broad liberal training as preparatory to and combined with, and as an essential part of, the education of the professional man whether he be doctor or lawyer or engineer.

The subject on which I wish to say a word to you is one very near my heart. In a recent visit to Panama with and as a member of the American Institute of Mining Engineers, I

was greatly impressed with the advanced and broad policy shown by the Government engineers in the provisions made for the health, comfort, and pleasure of the army of employees who are pressing to early and successful completion that great national work, the Inter-oceanic Canal. It has come to be recognized in great engineering work, such as this, and in the great industrial and mercantile establishments of the day—that care given in this direction is productive of a financial return in steady work, good order and the promotion of esprit de corps, well worth the expenditure involved. Unquestionably the main reason for the disastrous failure of the French in their attempt to build the Panama Canal was the want of that knowledge developed by our fellow-countrymen in their self-sacrificing experiments in Cuba in 1900-01, of how to cope with the frightfully insanitary conditions formerly presented in tropical work. To-day employees on these large works are well-housed, well-fed, and well-cared for. We teachers can take a lesson from this. *Mens sana in corpore sano,* is a good motto to ever keep before us in the matter of the care and oversight of our young men, and from the time that the Alumni of Lehigh, five years ago, came forward and asserted their wish to do things—not merely to say things, that should promote the bettering of living conditions in the college life—we have found how easy it is to better them when we really put our shoulders to the wheel. In these five years we have instituted dormitory life and have built and opened our College Commons where our men can obtain good, healthful, appetizing food, at cost. The food is bought and furnished direct by the University, not through any contract system which might result in the furnishing of an inferior grade through the allowance of a profit to the contractor. Our Fraternities are building on or near the Campus, and their members are making use of the Commons, where the coming together three times a day of a large body of the students is conducive to the promotion of college spirit and good feeling.

We have little or no discipline to be exercised by the Faculty. The dormitories are ruled by student managers elected by the students themselves. The University is, as a whole, in respect to good order, under the control of the student organization known as the Arcadia, composed of students elected by the

students to important executive positions in the various student activities.

The Honor System is in force, and infractions are tried and punished by the Arcadia—with power of suspension for a year —the sentences being of course reported to the Faculty, and being subject to reconsideration by the Faculty, but as a rule, we have found the student action just and rigorous.

We believe at Lehigh in the encouragement and promotion of athletics, but the nature of our curriculum, particularly in the engineering courses, involving many hours in the laboratories and drawing rooms, has resulted in our Course in Foot-ball falling rather behind the reputation we have been solicitous to win and maintain in our scholastic college work proper. Personally, I am highly in sympathy with Cecil Rhodes' view in the establishment of his Oxford scholarships—calling for evidence in the candidate of not only a certain standard of scholarship, but also evidence of athletic training, and of interest shown by the candidate in school or college affairs—leading to an all-round manly efficiency.

In addition to the care that should be given to the bodies and health of our students, our Alumni (and in these matters they have had the hearty co-operation of the Faculty)—have been, and are, solicitous, (as the principle was expressed by one of our leading Alumni at a banquet at Wilkes-Barre some years ago), that when a boy has been once admitted to college, care shall be taken to give him every proper help to stay in college.

Now the dealing with this problem is somewhat differently presented in the large university numbering several thousand students, and in the smaller institution with a student roll in the hundreds. In a large university it is difficult, possibly impracticable, to pursue any plan involving individual consideration of each case; and the dropping of students for scholastic deficiency becomes largely a clerical work of checking off and dropping men who have failed to reach a certain mark or standard. But we know that it is often the case that of two students who are falling behind in work, one may have the physical and mental strength to make up the loss and save the precious year or years that would be lost by dropping out, while the other may have, by his work or course generally, demonstrated that he is not college timber, and that it is best for himself and for his associates that he should drop out.

How this matter could be dealt with to the best advantage we considered carefully and deliberately, and we then instituted what we call our Conference Department, which in its make-up is, I think, peculiar to Lehigh.

We men and women know that it is the very exceptional man or woman who goes through life successfully in all things, never needing help—never having the experience of being helped and supported and stayed at times by sympathizing friends. What are we that we should expect our young men and young women to be infallible? We all know of, and probably all disapprove of, the coaching schools and systems that have grown up at various places, involving payments of from one to five dollars an hour for cramming to pass a quiz or an examination. Some help will always be sought and will always be necessary at times to some men, but it should be given by and under such care and supervision that the student requiring aid is judiciously helped, to the end that his power of independent study and his self-reliance shall not be weakened but shall be strengthened and that he shall be given only that measure of help that shall aid him to recover his grasp on his work and to then go on by himself.

After two years experience with our Conference Department, I am inclined to think it meets this need. The Director of the Department is an experienced teacher—a Professor of Mathematics, a man having a strong personal sympathetic interest in students. He also holds the position of Chairman of the Freshman Advisory Committee of the Faculty. Able, mature teachers from the departments of Physics, Chemistry and Modern Languages represent those subjects in the Conference School. It sits on Monday, Tuesday, Thursday and Friday evenings from seven to nine for consultation with any Freshman or Sophmore who desires aid, the fee being $1.50 for the four lessons. This fee is made as low as possible consistently with the department being self-supporting—the idea being that it shall be run at cost.

The teachers have no interest in the fees paid. They are paid salaries by the University, irrespective of the number of students taught, and their work in the college classes is apportioned to permit of their taking on this additional burden in the Conference School without undue strain. The advantage of this system is that the student needing help is given it not by an outsider, but by a

competent teacher who is, at the time, teaching in college in the study in which aid is needed. This teacher knows what should be done for the student, and he is careful to lead,—not to carry the student—he is soon able to judge whether the student is fit to go on, or whether, for his own good and the good of the college, he should be dropped as a hopeless case. This system also eliminates all danger of the scandal, generally unfounded, but always recurringly present, of suspicion, where an instructor in a department is permitted, for fees, to coach students, that men are flunked for the prospective coaching fees involved in their rehabilitation.

This system has the advantage of practically assuring the student that he is in friendly and sympathetic hands, and to the end that its benefits may be extended to needy students who cannot pay even the small fee of $1.50 for four lessons, this school sits on Wednesday and Saturday afternoons, from 2 to 4 P. M. (our half-holidays), free of cost to all Freshmen and Sophomores applying for instruction and aid.

I believe in the principle I heard emphasized by President Sharpless years ago, that Freshmen, the younger students, should have the care of mature, experienced teachers—not be relegated to young instructors—and this principle is at the bottom of our Conference Department at Lehigh. It has been aptly termed a "First Aid to the Injured." It is not intended to help a mentally incompetent, or a careless student, to stay on in college—but to put a worthy man on his feet after a fall, —and I believe that this, or some similar systematic arrangement, is a thing we owe to our boys, and one calculated to be of inestimable benefit to many a young fellow struggling manfully against difficulties that may overcome him if he is left to fight them alone, but which he may be able to overcome by judicious and discriminating help extended at the right time and in the right way.

RESPONSE.

PRESIDENT JAMES M. GREEN.

There are two very essential factors in entertaining the host, and the guest.

It a pleasure at any time to receive an invitation from one

who is known for his good fellowship, but if in addition he has won some distinction we are especially pleased with the invitation.

Lehigh University is well known for its good fellowship. We are given demonstrations of this quality on every hand, but more than this she has distinguished herself by a very important work in the advancement of learning in our country, especially in the development of technical learning. This makes us feel particularly complimented in being bidden as her guest.

We would not be worthy as guests did we not make genuine preparation for our visit. The Executive Committee in arranging for this meeting have tried to make it, so far as possible, expressive of the thought of the Association. Early in the year we wrote to all of the institutions having membership, asking for suggestions for the program. We received an answer from nearly every institution addressed. Many of these answers stated the problems that were of vital interest at this time, Later, after the subjects had been chosen, a large number of the institutions were asked to suggest the persons who would best take the parts that had been proposed.

President Drinker has referred to this University as democratic. Certainly our Association is democratic. The program that is prepared speaks for the whole organization.

In our preliminary inquiry the strongest expression that came was to the effect that the time was at hand for a clarifying of the curriculum. Much had been said on the cultural; much had been said on what it was absolutely necessary a student have if he would be fitted to accomplish certain things. To distinguish these two phases, the cultural and the essential, gives coloring to our whole program.

In reaffirming our appreciation of your hospitality, we want you, President Drinker, together with your Faculty and your Board of Trustees, to realize that we have made due preparation for the occasion, have indeed put on what seemed our most appropriate wedding garment, that you might not be sorry you had taken us to your home and your hospitality.

MATHEMATICS FOR TRAINING AND CULTURE.

PROFESSOR WILLIAM H. METZLER, SYRACUSE UNIVERSITY.

The aims which any teacher is to keep in mind in teaching his subject depends to a certian extent upon the nature and object of the school in which he teaches.

The college aims at general training and culture, while the professional school aims at technical skill. The secondary schools have for their object the preparation for a broad life, while the technical and manual training schools prepare for a special life. The secondary schools must furnish the preparation for those who are to take more advanced work, as well as the principal training for those who aim at only a common education.

If I am to consider the educational value of mathematics and what our aim should be in teaching it, I must prepare the way by enumerating at least the salient points in the objects for which I consider the schools exist.

The state supports its schools for the purpose of making good citizens, and good citizenship involves at least the following: a well rounded and developed mind; a generous heart with a firm but unselfish purpose; vigor of body, soul, and mind to put into operation and carry out the high purposes of life.

The cultured and well trained mind makes possible intellectual enjoyment as well as fitting the individual to better meet the various aspects and situations in life. Ignorant and unbalanced minds characterize those who are swayed by superstition and led in herds by the bosses.

Lack of an unselfish and noble purpose in life makes possible the political boss and furnishes the criminal of both low and high degree—those who steal the dimes, and those who steal the millions.

Mental training, balance, and high purposes are of little value unless they are put into operation and carried out. To will to work and to work with a will must become more characteristic. We must use our powers and talents if they are to increase, for unused powers soon deteriorate. Not only must we use them, but we must do it for the good of humanity rather than for our own selfish purposes. Altruism and not

selfishness characterizes the good citizen, and we must encouraage whatever develops the one and eliminate whatever tends to increase the other.

The teaching of mathematics should have for its object the development of those qualities of mind and heart that go to make good citizens.

The direct applications of the content of mathematics to the affairs of every day life are so limited that we can make no claim to hold it, to any extent, in the curriculum for that reason. Its main claim comes from the unique training that its study furnishes. Its study should not be looked upon (as it often is) as resulting in a certain mathematical content only, but rather in powers developed—powers that are of the greatest advantage to every one in all walks of life. From this standpoint mathematics is very practical, as I hope to show, but in speaking of the training and culture versus the practical element in education I understand the word to be used in the utilitarian sense.

What can be better for the development of the powers of concentration and clear thinking than mathematics if properly studied and taught? We learn to do by doing and these powers are absolute requirements in its study.

The reasoning of every day life does not differ in its nature from that in mathematics. The facts or hypotheses may differ as to their certainty or uncertainty, but once the judgment has entered its verdict as to the probable truth of the hypothesis the reasoning is the same. Almost all reasoning is a succession of brief syllogisms, where the conclusion of the first is the premise of the second and so on, and the difficulty people find in the reasoning is largely due to the fact that in the transition of a proposition from the conclusion of one syllogism to the premise of the next there is apt to be a loss in meaning and definiteness so that the proposition is modified. The order in which the syllogisms occur is important and in mathematics this order is much more important than the syllogisms themselves. It is the lack of this intuition or sense of order that makes mathematics so hard for most people. The study of mathematics develops logical and accurate reasoning power.

Good judgment, so essential to mental balance, is a very important element in any mental equipment. It is, roughly speak-

ing, the ability to sum up a situation in its true relations, and in mathematics, in the essential and close relationship of part to part in any proof or problem the student learns not only what constitutes a proof, but has his judgment well developed and learns to see things in their true relations, which is an important element in any situation of life.

To work to advantage and accomplish results in mathematics it is necessary to use good methods of work, to learn what tools are at our command and how to use them. The study demands that a careful discrimination of the useful data be made, the essentials distinguished, the possible and best methods of attack recognized, and by careful selection and elimination the best way to go about the problem taken. Good mental habits are of very great importance and the proper study of mathematics will certainly develop them.

In mathematics more than in any other subject the student is enabled to discover for himself and to enter into the real spirit and enthusiasm of discovery. It is here he has, as no where else so early, mental activity for its own sake in which case his stimulus comes from within, the source of all true stimuli. It is here also he learns in a very conspicuous way the economization and concentration of mental effort and sees in it a type of economy for all human labor.

Such habits as neatness and accuracy are also very valuable products of mathematical study.

Again mathematics develops the spirit of truth and honesty. Mistakes in a piece of mathematical work are easily seen and when seen must be corrected so that a habit of guarding against error and correcting it, if made, is splendid training for the analogous situations in moral life.

Most people do not look upon mathematics as touching the emotions but it of necessity does touch them very closely. There is such a thing as mathematical beauty, beauty of form, harmony, and elegance which attracts our attention and interest, and satisfies our emotional sensibility.

Students, in harmony with the spirit of the age, are inclined to ask what this or that subject is good for and to estimate the value of a subject by the use to which they see it may be put. Interest in it is also sometimes the measure of the value of a subject. They seldom realize that one great equipment for

life is to be ready and willing to do the difficult thing because it is well worth doing. The study of mathematics furnishes an execellent training in will development.

There are other powers that the study of mathematics develops, but perhaps I have mentioned sufficient to show that the subject has large training and cultural values for all. They are powers that will be needed in all walks of life. They, more than the content, are the valuable products of mathematical study, and because of their great value should receive the most careful attention.

There is, however, another reason why we should emphasize this side of mathematical study, for in so doing we emphasize that which tends to better morals and higher planes of living. To emphasize the utilitarian side of mathematics is to give students the wrong attitude towards the subject, an attitude that will prevent them from getting much out of it and take away that which will yield them true happiness and render them a center and source of happiness to others. Such emphasis tends towards selfishness. Students should feel that mathematics is not for the few only, but indispensable to the daily life of all. As Professor Dewey well says it is "not the thing done but the quality of mind that goes into the doing that settles what is utilitarian and what is unconstrained and educative."* He also says "Truly practical men give their minds free play about a subject without asking too closely at every point for the advantage to be gained; exclusive preoccupation with matters of use and application so narrows the horizon as in the long run to defeat itself. It does not pay to tether ones thoughts to the post of use with too short a rope. Power of action requires some largeness and imaginativeness of vision. Men must at least have enough interest in thinking for the sake of thinking to escape the limits of routine and custom. Interest in knowledge for the sake of knowledge, in thinking for the free play of thought, is necessary then to the emancipation of practical life—to make it rich and progressive."**

I am a thorough believer in the transference of power from one thing to another, in general training, or whatever name we may give it. The old extreme type of formal discipline has

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*Dewey, *How We Think*, page 167.

**Dewey, *How We Think*, page 139.

gone and the equally extreme, but newer psychology, which denies all forms of general training is going. In their place we are to have a saner doctrine which not only admits general training but which will establish the best means and conditions of obtaining it. These the schools must learn and make use of. In my judgment the most important result obtained from the study of most subjects is the general rather than the special training furnished.

The fact that there is a transfer of training I think has been abundantly established, by long years of exeprience, by a priori reasoning, and by recent experiments.

To-day the school curriculum is crowded with a variety of subjects that on account of their very multiplicity, tend towards distraction rather than concentration of attention and lead to poor habits of mind. In spite of all this the agitation still goes on for the curtailment of the time devoted to some of those subjects that have stood the test of time and have been instrumental in producing strong minds and vigorous characters in the days gone by.

I freely admit that results commensurate with the time devoted to it have not been produced in the case of mathematics, but of what subject have such results been true?

Much is being done to-day to improve the teaching of mathematics, and with improved teaching and the emphasis in the right place will come better results.

This is a commercial and on the part of the individual a selfish age which the schools should counteract rather than intensify. The laborer is no longer worthy of his hire, but exercises his ingenuity to see how little he can do for the pay he receives. His interest is not in his work and he makes no effort to do it well, but rather skims it over content to have it pass sufficient muster to receive his pay. High ideals and a spirit of honesty would do much to revolutionize labor and cure its evils. This is not only true of many working men, but of some others in the higher walks of life. The general spirit back of it all is to get all you can for as little as possible. The spirit of sacrifice and service is altogether too little appreciated, and this is perhaps why the teachers of the country do not command more respect than they do.

The cry is for material prosperity and in harmony with it

many educators are demanding more attention to those phases of work that seem to them to touch more directly the ability to supply the needs of the body. I believe most thoroughly that every citizen should be able to earn his own living and more. He should produce his share of the wealth of the world, but the question I raise is: What is the best equipment for this? Is it mental and moral development, or is it manual and technical knowledge of trades gained at the expense of these? I believe in manual training and in technical knowledge, but I do not think that much if any of the time devoted to the public day schools should be devoted to teaching trades. Moreover I do not think it possible to teach trades in this way even if it were desirable. Labor has become so specialized that no one man knows all its forms for any one trade. I heard a tailor say recently that there were some forty operations in the making of a coat and each man knew but his own part of the work. Because of this a laboring man of large mental development said not long since that what labor desired of the schools was not to teach manual labor or trades, but to turn out boys and girls with honest purposes and able to think for themselves.

In considering this question we must remember that to emphasize the utilitarian tends to suppress individuality and have the worker become part of a machine. The highest type of work cannot be done unless the worker allows his individuality to enter and produce its fruits. A man must not only know the meaning of his work, but its bearing upon human development if he is to do it well. Character must show itself in his work and the work must tend to produce character.

We need to instill more of the spirit of real scholarship—that passion for the true in the things we seek as well as in the working of our own powers. President Tucker says: "The truth-loving mind is more apt to be endowed with insight, invention, and initiative, than any other kind of mind."* Professor Clifford in speaking of the difference between scientific and technical knowledge said: "Both of them make use of experience to direct human action; but while technical thought or skill enables a man to deal with the same circumstances he has met before, scientific thought enables him to deal with different circumstances he has never met with before."**

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*Tucker, *Personal Power*, page 218.

To-day when the schools must bear so much of the responsibility for the pupils' development, if they are to reach higher planes of living, the culture and training elements must be ever prominent if they are to be secured.

The tendency outside of the school is to emphasize the material so we must be careful that it does not enter. The schools should be the fountains of the pure waters unadulterated with commercialism and selfishness. It is a lack of culture, training, and good morals that make class distinctions and that makes the problems of government and society so difficult to handle. The best preparation our schools can give for all students, no matter whether they are to go on, or out into life, is a well trained and balanced mind, and a high, unselfish purpose with ambition to carry it out. Strong and noble character is one of the world's greatest needs.

Those who study their mathematics for training and culture have not only a far better equipment for making a living but are better equipped for an enjoyable and useful life. They will be better characters. Again President Tucker says: "It is, after all, the scholar in the broad sense of the term, the man who has learned how to investigate, to analyze, to reason, to invent, to anticipate, who is most in demand in the business world."* James Bryce says: "The study of the liberal arts fits men to profit by the teaching they will receive from the other colleges. They will be all the better chemists, or engineers, or lawyers, or bankers, because they have received a training in scientific theory or in language and literature which has given them a true outlook over the field of knowledge. They will be better citizens, more zealous to serve the state, better fitted to serve it wisely as well as honestly."

In Germany, in France, and in other European countries the leaders in educational thought have been very careful to point out that while mathematics may well draw its examples from every day life, its independent importance as a means to develop culture and training must not be lost sight of.

It cannot be true that we in this country are to allow this commercial spirit to control our schools. If they are to remain the center and source of what little culture the majority of the people get it behooves us to see to it that they are dominated by the proper spirit.

THE CULTURAL VALUE OF MATHEMATICS.

PROFESSOR WILLIAM WEIDMAN LANDIS, DICKINSON COLLEGE.

It is related that Euclid was once asked by a boy to whom he was trying to teach geometry: "What do I gain by studying this stuff?" Whereupon the master turned to a slave and ordered him to give the boy a few coppers: "Since," he said, "he must make a profit of what he learns." Probably no question confronts a teacher more frequently than this of the practical value of his subject, and possibly none is fairer nor more disagreeable. Perhaps we would all prefer to give Euclid's answer to it were it not for the swift and final bankruptcy involved. When asked of my subject I invariably profess ignorance of the meaning of the word "practical"—an ignorance not wholly simulated since I see every day a window bearing the legend "Practical Hair Cutting," which presents to me an insoluble problem—and while my questioner flounders in the inky waters of his own darkling explanation, I escape somewhat in the manner of the cuttle-fish.

Three instances will illustrate my difficulty. The late President Gilman, in an address upon the constituent elements of an education, said among other things that no man was educated unless he could express himself freely and fluently in the spoken and written language of another than his mother tongue. I find that a hard saying, yet thousands of men who serve as waiters or in similar capacities find such knowledge not only of one but of several languages an indispensable part of their equipment. And to many men Latin is not a dead but a spoken language.

I have a friend who is a successful engineer. I think he does not know the difference between the tangent of an angle and a definite integral, and to him a derivative would be a suspicious, if not an improper, fraction. But his structures are stable, his trusses trustworthy, and his machinery does its expected duty.

A teacher of mathematics was once praising, in the highest terms, the work of a former student, who happened to be a young lady, when he was interrupted with a variant of the usual endlessly-repeated, infinitely wearisome question, "What is the use of a girl's studying Differential Equations?" "Well,"

he replied, "she got a husband by it." On the principle of "first catch your hare," I think the questioner was thereafter inclined to include Differential Equations in a group of severely utilitarian studies, such as sewing, cooking, the management of a household, the value of foods, etc.

It would be easy to multiply examples showing that, if we could draw a line clearly separating the practical from the cultural values of a subject, the position of such a line would vary with different classes of students and would depend in an entirely unpredictable way upon persons and circumstances. It could also be shown that even if such a line is determinable its position is a function of the time. For example, it has been within a comparatively recent period that reading and writing have passed from an accomplishment for the few to a necessity for the many.

And now, though I am asked to distinguish between the cultural and the practical, I shall attempt merely to mention some of the cultural values of the study of mathematics; so what I shall say is in some way an Apologia pro mia Vita. And since you are sure to discover it I will admit now that all the things I have learned about the science and art of pedagogy have long been known to every one else. But must not every one find out for himself "that the property of rain is to wet, and fire to burn, and that a great cause of the night is lack of the sun?"

I had been in charge of classes in Solid Geometry and teaching them at intervals for a number of years, when I discovered that while we were not always teaching Freshmen as much geometry as we wished, we were teaching them a good deal of English; and I have since gone about it consciously and purposefully, and have been much happier in the work. A learned psychologist tells me that I am probably wrong; that if we are teaching English we must necessarily sacrifice the teaching of mathematics; and we have the highest authority for the statement that no man can serve two masters. Yet I am not convinced that the study of Solid Geometry has not, as an important by-product, a great deal of very valuable training in English, nor even that such training does not constitute a quite considerable part of the value of the study. Of course, the business of a teacher of mathematics is to teach mathematics.

but we are all engaged in one task; and some things are best seen with partly-averted vision.

Let me illustrate: If a geometrical figure is put before a class and—each one adding his opinion or observation—there is finally forged out a definition or description of the figure which shall include all cases of such figures and exclude all others; if then the class gradually condenses and refines that description into a concise and impeccable sentence—following the advice of the incomparable Pym to T. Sandys, "Write a bit of description and when you have done chortling over the result reduce the whole by half and miss out nothing"—if then some properties of the figure are tentatively proposed and it is proven that they do or do not exist; and if that proof is refined and condensed in the same way, why, then, an hour has passed and we have arrived at results which could have been given on the authority of the teacher or text-book to a passively receptive mind in five minutes. But we have taught some geometry, and have we not also taught some English? That definition is difficult, and such work necessary, may be shown by the fact that the definitions found in some text-books are at once incomplete and incorrect, as our classes discover.

When the proof of a mathematical theorem is complete you cannot take one word from it nor can you add a word nor change a word or phrase without injury to the proof. In this respect it is like a poem. So the teaching of geometry gives opportunity for insisting upon, or rather for demanding, the most scrupulous exactness, the most meticulous particularity in the use of language. And if one thing more than another is the mark of the educated man, is it not the purity and virility of his speech?

Nor is it evident that the training in formal logic afforded by the study of geometry is entirely valueless. At least the student will enjoy discovering for himself the logical necessity of the sequence of propositions, in tracing each back to the underlying axioms or postulates, in noticing that through the series of theorems "one unceasing purpose runs." Every book which is worth while has, I believe, such a purpose running through it, and the author, from first to last is pressing forward to his final, inevitable conclusion. And where can we learn how to look for and how to distinguish that logical thread better than in the study of geometry?

Mathematics has been defined as the science which draws necessary conclusions. Is this not a definition of all our deductive reasoning? It has been remarked that man does not often use his reasoning faculties, but when he does, does he not proceed on the same lines as in mathematics? From certain assumed premises does he not draw, as logically as he can, certain necessary conclusions? The difference between the thinking in mathematics and in the other affairs of life is simply that in mathematics we assume the premises, while in the business of life an investigation of them is the most important, as well as the most difficult, part of the problem. And if the student of mathematics is shown, or rather discovers for himself, that the whole superstructure of the science rests upon a few underlying principles which are assumed because they are difficult or incapable of proof; if at the proper stage of his development—and rather too late than too early—he is shown that there is a non-Euclidean geometry or a non-commutative algebra; if there are presented to him for investigation some things which are not certainly true, but whose truth or falsity he must discover, then is not his mind doing some of the sort of work it will do thereafter, whether he may be engaged in thinking about the tariff, or, like Kepler, appraising the merits of the young lady he will marry—if she will have him.

I believe it will be admitted that every educated man should know something of the earth on which he lives, and something of the relation of that body to the universe. In order to have clear ideas of astronomy a good deal of space imagination is requisite; that is, one must have the ability to form definite and vivid mental pictures of three-dimensional figures. And not only is this ability desirable in the study of astronomy and many other things, but its acquisition in great measure stimulates and expands the mind. One's mental horizon wonderfully broadens as his physical horizon extends to a line on the celestial sphere and as he endeavors to orient himself in the immensities of space. And the beginnings of this power and enlargement are found in Solid Geometry.

I cannot speak so highly of Trigonometry as a cultural study, so to save time I will mention, without comment, some training we get in it: training in accuracy, of course; also in the adaptation of means to a desired end; and some very desirable

and surprisingly necessary practice in the simpler operations of arithmetic.

In the algebra taught in college there are a number of subjects of great value. Determinants, for the strict logical development so far as the solution of equations; theory of numbers, theory of equations, and other subjects for novel methods of proof, but principally choice and chance. These latter subjects offer a congenial field for the student who is easily wearied by the complexities of algebraic expressions. Here the algebraic work is at a minimum, and thinking is the chief requirement. Also a student must carefully scrutinize the language of a problem, as the change of a word, or even of a punctuation mark, may change the problem unrecognizably. One explanation of the difficulty students have with mathematics is that they cannot read. I do not mean that they cannot untangle algebraic complications, but that they cannot read English. This inability is possibly more annoying in other subjects, but it is not so infallibly fatal. A student can—and many of them do—glance hastily over a page of history or literature or whatever it may be, and get some vague and formless idea of what it is about, and thence delude himself with the idea that he has studied and has learned something. Paradoxically expressed, being unable to read, in some fashion he reads many things. But unless he can really read his own language he cannot read mathematics. Training in reading is furnished by the subjects of choice and chance and others of the chapters which constitute college algebra, by problems in elementary algebra which lead to equations, and, in fact, many parts of mathematics require and repay this microscopic scrutiny of the medium by which our thought is half revealed, half concealed.

Some of the merits of the work in mathematics usually required are, then, that this work furnishes a means for training the student in reading, in clear logical thinking, and in concise, complete and apt expression. And in what other subjects are we in better position to insist that the student's thought, as it concerns exceedingly definite things, shall be entirely definite, and that it shall be clothed in the language perfectly expressive of it?

Of course, it is objected that one who can think clearly and express himself adequately on mathematical subjects may be

able to do neither on any other subject; and there is, no doubt, some foundation for that opinion. But if one puts up a dumb-bell regularly he will strengthen certain muscles. He may not then be strong, but does it follow that these muscles can be used for nothing else but dumb-bell work, and that his strength has not increased? One who has had thorough training in mathematics may remain in all other affairs chuckle-headed; but if any one thinks he has not become less so, is not such a one himself—well, at least illogical?

Just as a good deal of what was once in our arithmetic has been swept away to our great advantage, so Professor Perry would cast aside all, or nearly all, our geometry; and there is a tendency to crowd to the wall subjects which do not directly prepare for the calculus. We must have, it appears, the calculus ever earlier. It is soon to be taught in the high school. While no one can object to a rearrangement of our courses that shall be pedagogically sound, and while it is desirable that we should batter down the bulkheads which divide mathematics rather artificially into separate compartments, yet I cannot bring myself to abandon geometry and some subjects in college algebra, both on account of their extra-territorial dominions which I have tried to describe, and also because our students seem to need the extra mathematical training which they get in these subjects. For the student who will not make any direct use of his mathematics after he leaves college, a class which includes the majority of the students in a college of liberal arts, it seems to me that the training he receives from geometry and college algebra is quite as valuable as that which he would get from a premature study of calculus. I know that is an old-fashioned view and I am very desirous of being convinced that I am mistaken. But at present I do not feel justified in sacrificing, as it seems to me, the majority for a possible benefit for the comparative few. And is it so desirable to reach our journey's end that we must, through excessive haste, miss all the pleasure and profit to be derived from the views by the way?

Only those who have learned to read and write the language of mathematics with some degree of facility and pleasure will voluntarily continue their studies through Analytics and Calculus. They will obtain from the Analytics some knowledge

of the conics, with which every one should have some acquaintance on account of their frequent occurrence in nature. And if the first course in Calculus comprises a minimum of theory and a maximum of applications the student will realize how powerful is the machinery for purposes of discovery which it furnishes and will delight in working it himself. Even in Differential Equations some applications may be made to physics and celestial mechanics, which are as important as they are fascinating. Mathematics, probably, more largely than other subjects, is retrospective. Studying Analytic Geometry and Calculus one learns a good deal of algebra; in Differential Equations, a good deal of Integral Calculus; in Spherical Astronomy, a great deal of Trigonometry, and in Solid Analytics, plane geometry, determinants, theory of equations, etc.

The value of the study of Projective Geometry and of the quadric surfaces is largely esthetic. And while their beauty is purely intellectual and entirely insensuous, whatever development, whatever inspiration may be claimed to result from the contemplation of beauty, may also be claimed for them.

Prof. H. F. Osborne, in an address delivered a few weeks ago, laid great stress upon the necessity of training in productive thinking, if such training is possible. And such training *is* given by the study of mathematics, and this is the greatest value of such study. From the beginning of his Plane Geometry, or probably earlier, but principally in that subject, the student is a discoverer. And one of the first things he discovers is that he has an intellect; that he, too, can seek and find mathematical verities. Then feels he

> like some watcher of the skies
> When a new planet swims into his ken;
> Or like stout Cortez when with eagle eyes
> He stared at the Pacific—and all his men
> Looked at each other with a wild surmise—
> Silent, upon a peak in Darien.

And this productive thinking characterizes, to a greater or less extent, all work in mathematics. It is more or less a requisite in all problem work. In original work in geometry, in solutions of problems in algebra, in analytics, in Calculus, even in such almost mechanical work as finding a center of mass

by a multiple integral, in the applications of Differential Equations, in the problems of Projective and of Solid Analytical Geometry; everywhere the student feels the joy of discovery; and there is nothing more thrilling. It is like finding the right word. This may be the reason that most mathematicians are also students of literature. And if the study of mathematics had no other fruit than this: that the student may be helped in some degree to find himself; to be freed in some measure from the paralyzing thralldom of authority, to do a little of his own thinking, to acquire to some extent the mastery of his mind; then that study would be eminently worth while, even though the subject-matter might be no more valuable than magic or the black art.

However, I am firmly convinced that the greater part of the culture or education derivable from the study of mathematics is due to this: that thereby the student acquires some knowledge of mathematics.

SOME ASTRONOMICAL PROBLEMS AND THE MATHEMATICS INVOLVED.

PROFESSOR ROBERT WOODWORTH PRENTISS, RUTGERS COLLEGE.

It is a remarkable fact that the characteristic features of the heavenly bodies are just beyond the range of the naked eye. The application to the skies of the newly invented telescope revealed to Galileo, in 1610, the spots on the sun, the crater of the moon, the phases of Venus, and the satellites of Jupiter. Men began to see what they had not before been able to see. The telescope discriminated between the planets with rounded discs and the stars which continued to shine as mere glowing points. It brought to light the nebulae, star-clusters and multiple stars and showed the true constitution of the milky way. It did more: it overthrew the Aristotelian philosophy of the divine nature and incorruptibility of the heavenly bodies, confirmed the Copernican system, and gave to man a truer conception of the visible universe and of his place in nature. The enlargement and development of this instrument through the centuries have widened the field of discovery and inquiry and brought refinement and precision into observations for measurement. The progress of astronomy on the physical side has been inseparably bound to the telescope.

In like manner an understanding of the phenomena and principles of astronomy seems to be just beyond the reach of the average intellect. Here nature works on so magnificent a scale, in a domain so remote from human affairs and where the conditions are so strange, unusual and so nearly ideal, that it is not surprising that there should be difficulty in unraveling her secrets. The problems of this science are of sublime import and have a great and fascinating interest to many minds. There is a considerable class eager to learn and know about the stars.

Yet it must be acknowledged that the attainments made are not commensurate with the enthusiasm and the effort put forth.

There is a widespread failure to appreciate the elementary principles of the subject, to apprehend the true objects of the science. Too much emphasis is put on the superficial and sensational features. The striking results are noted, while the principles and methods involved with the difficulties in application are set aside and ignored.

We need, in the domain of mind, some instrument, analogous to the telescope, to widen its horizon, give it more penetrating power, and to break down the barrier between the human understanding and the beautiful system of the universe.

Where is such an instrument to be found, and how it is to be used?

I believe it is to be found in a more thorough-going, courageous, faithful and persistent application of mathematics as necessary to the proper understanding of the phenomena of nature in astronomy and the physical sciences generally, in presenting to our pupils and making them carry through to a finish some of the fundamental and great historic problems that have made epochs in science. This so far as their mathematical attainments will allow, and perhaps a little farther. The principles behind these problems should be examined and emphasized, and their bearing on other branches of science pointed out. Our men should be encouraged to read and to study these problems historically and as they have been treated by the great masters and discoverers themselves.

They should not stop short of the fountain-head of a great truth. Sir John Herschel, although he was an eminent writer and lecturer on Popular Astronomy, said: "Admission to the sanctuary of the temple of Astronomy is only to be gained by one means—sound and sufficient knowledge of mathematics, the great instrument of all exact inquiry, without which no man can ever make such advances in this or any other of the higher departments of science as can entitle him to form an independent opinion on any subject of discussion within their range."

In considering a few astronomical problems on their mathematical side as typical or illustrative, I am aware that many another and better selection might have been made. In a recent number of "Knowledge" the question is asked: Without instruments, books or knowledge of compass bearings how can time be found approximately at night?" The substance of it is asked of "Boy Scouts," who desire to obtain the star-badge of astronomy. The question in itself is not important (for all practical purposes the answer might be—Guess it!), it suggests, however, the notion that in some way time is determined by the stars. But how?

To correct the vague theories of the motions of the sun, moon

and planets, Hipparchus invented trigonometry. The first class of problems to which I wish to call attention includes: the determination of time, latitude and longitude on the earth, and the positions of the stars. These problems are the province of Practical or Spherical Astronomy. Their solution depends almost entirely on spherical trigonometry: on the solution of spherical triangles and the transformation of trigonometrical formulas. In the celestial sphere we have an excellent exemplification of spherical trigonometry. This sphere is perfect, natural, convenient, and everywhere available. It has been defined as a sphere whose center is everywhere and surface nowhere; in other words, every observer is within this sphere and is distinguished by being exactly at its center. Its radius is indefinitely great or as great as we please.

Although no meridians or parallels are marked upon it, it is spangled with numerous bright and fixed points, which are just as useful for reference.

Moreover, the element of time comes in, for this surface is revolving uniformly once in twenty-four hours with a uniformity so precise that no variation has ever been detected. It is positively stated that the day has not changed by so much as one-hundredth of a second in twenty-five hundred years. It is the standard of time.

Consider the astronomical triangle. It is a spherical triangle on the celestial sphere. Its vertices are three important points: (1) The zenith, which is always exactly overhead; (2) the celestial pole, a point practically fixed, round which, as on a pivot, the heavens appear to turn; and (3) the star or heavenly body observed.

The sides of this triangle depend upon: (1) The latitude of the place of observation; (2) the altitude of the star, and (3) the declination of the star, one of its absolute co-ordinates. Its angles depend (1) on the azimuth or bearing of the star observed; (2) on the time of observation. The third angle is of no general importance. A remarkable combination!

This triangle contains five important parts: time, terrestrial latitude, declination, altitude and azimuth—any three of which being given the others may be obtained. For example, the altitude and azimuth of a known star being got by observation, the latitude of the observer and the standard time may be calculated.

The problems of practical astronomy, including the theory and use of different instruments, the determination of standard time, the rising and setting of sun and moon, the position of the stars and points on the earth, etc., depend almost entirely on the solution of this triangle, and on the transformation of trigonometrical formulæ.

The study and use of this triangle will give to the student a valuable training in accuracy and carefulness, and in the art of numerical computation. It necessarily directs attention to the stars and gives a clearer conception of their positions and apparent motions than can be obtained in any other way.

In the history of astronomy the positions and apparent motions of the sun, moon, planets and stars come first. Hipparchus, Ptolemy and Tycho Brahe were pioneers in this field. Their labors have been continued by Bessel, Bradley, Flamsteed, and others, down to the present time, with all the precision and refinement which the improvements in instruments and mathematical methods have made possible.

In the next epoch the problems become more difficult. They are concerned with the real motions of the bodies of the solar system in obedience to the law of gravitation and the laws of mechanics as formulated by Newton. These problems require a knowledge of Analytic Geometry, the Calculus and Elementary Mechanics.

In the simplest form the problem is to deduce the motions of the planets in accordance with Kepler's laws, from the principle of universal gravitation.

*"This problem is important not only because of the extensive role it plays in astronomy, but also for its historic interest as Newton's principal discovery."

Early in the seventeenth century Kepler announced the remarkable laws of planetary motion that bear his name and which he had discovered from observation. These laws are well known: the planets orbits are ellipses with the sun at one focus; the line joining the sun and planet sweeps over equal areas in equal times; the squares of the periodic times are proportional to the cubes of the mean distances.

These laws, as found by Kepler, were empirical; they were

*G. W. Hill, Collected Works, Vol. 1, page 181.

based on no general principle. The object of inquiry then became to find the law of force which produced these motions. Early in 1684 the law of this force was discussed in London by Halley, Wren and Hooke together. While they suspected it to be the inverse square of the distance *no one of them could give a convincing demonstration.* It occurred to Halley to go to Cambridge and consult his friend Newton. Without mentioning his own speculations or those of Hooke and Wren, he at once asked Newton what would be the curve described by a planet on the supposition that gravity diminished as the square of the distance. Newton immediately answered: An ellipse. Astonished and delighted, Halley asked him how he knew it. "Why," replied Newton, "I have calculated it." In fact, Newton was the first to solve the problem, the first to appreciate its very great significance, and the first to deduce from it all its immediate consequences. The outcome of this event was the publication of the Principia, Newton's immortal work.

In Book I, Proposition XI, the concrete problem is stated as follows: If a body revolves in an ellipse; it is required to find the law of the centripetal force tending to the focus of the ellipse.

The demonstration takes up about one page of the Principia. It depends upon the properties of the ellipse as given in Euclid or Analytic Geometry and the elementary principles of mechanics. An exceedingly interesting point is the way in which Newton introduces a principle of the Calculus, recently developed by him, as a connecting link between the geometry and mechanics of the problem.

The study of this demonstration, so important in its bearings, as he presents it is highly instructive and inspiring. Most impressive is the exhibition of masterliness, directness and simplicity. It is important to compare Newton's solution with its present form in accordance with modern mathematics and note how far his geometrical method has been superseded by the more effective algebraic analysis. The great and universal law of gravitation having thus been established, it was not difficult to deduce Kepler's laws as immediate consequences of this principle.

It may not be quite useless to note in passing the problem of three bodies, for example, that presented by the Earth-Moon-

Sun systems, and the more general problem of n bodies which have engaged the efforts of the greatest mathematicians and exhausted all the resources of analysis. They have been solved approximately only in a few special cases. The resources of mathematics are not adequate to their general solution.

In the province of Celestial Mechanics perhaps no subject affords a better illustration of the adequacy of the law of gravitation to account for complex phenomena than the Tides. Among the interesting developments in the history of the mathematical treatment of the Tides are the prediction and analysis of terrestrial tides, the theoretical discovery of a tide in the solid crust of the earth and its very recent confirmation by observation and experiment, and the theory of tidal evolution which seeks to account for the origin of the moon and furnishes plausible explanations of some of the irregular phenomena exhibited by the planets and their satellites.

While these problems require rather difficult mathematics and extended and laborious processes for their complete exposition, they may be regarded in their simpler aspects and the principles adopted are of considerable interest.

One of the puzzling things about the tides, and a stumbling block to many, is the existence of high water on the side of the earth opposite to the moon at the same time that it is high tide on the side just under the moon. To say that the moon, by its attraction, draws the water to and away from itself at the same time seems paradoxical.

So we have the first and simplest problem: Given the moon attracting all parts of the earth in accordance with the law of gravitation to show why two opposite tides are raised at the same time.

The solution of this problem requires some knowledge of arithmetic and elementary mechanics. The earth, or rather the center of the earth, and the water on each side of it, may be regarded as three bodies. These bodies are each free to move. Since the force of attraction varies inversely as the square of the distance, the force on the portion of water nearest the moon is greater than that on the earth's center, and that in turn is greater than the force on the portion of water on the farther side. In fact arithmetical calculation shows that the forces are

approximately as 103:100:97. The average force or force on the earth, as a whole, is 100. This keeps it in its orbit and moves every particle alike. Subtract this force from each part and we have a force of +3 toward the moon on the moonward part, zero at the earth's center, and —3 on the farther part, or a force of 3 away from the moon. The effect is to deform the earth and make its diameter longer in the direction of the moon.

We cannot say from mere common sense or experience what its shape will be, but it can be mathematically shown to be very approximately a spheroid.

By the rotation of the earth these two watery protuberances are carried round the earth, from east to west, as a tidal wave, the interval between high tides, the period of the wave, being about twelve hours and a half, or half a lunar day. In lesser degree, because of its greater distance, the sun produces a similar wave, whose period is twelve hours, or half a solar day. At new moon and full moon these waves very nearly coincide, and the tides have a greater range in consequence, the resultant wave being the sum of the lunar and solar waves. But the moon does not move in a circular orbit, hence its distance and therefore its tidal effect vary during the month. Neither does the moon move in the plane of the earth's equator, but is north of it half the month and south of it the other half—this causes another wave superposed on the chief lunar tidal wave. There are similar inequalities in the annual motion of the earth around the sun. Each inequality in the motion of the sun or moon since it changes in a cycle repeated over and over again introduces an independent wave. The actual tide is due to the superposition of all these waves.

The important consideration in this connection is: that on the one hand we may mathematically deduce, by Newton's law, from the known periods of these changes and the varying positions of our luminaries, the measure of each component wave (about twenty-three in all give sensible results), and by adding them together predict the height of the tide for any place and time.

On the other hand, having the record of the tides at any place at regular intervals covering a period of a year or more the tides may be analyzed and the part contributed by each component wave determined.

This result is obtained by the application of a beautiful and powerful mathematical method known as "Harmonic Analysis," set forth in "Fourier's Theorem" or "Fourier's Series."

Each wave executes a harmonic motion, similar to the movements of a musical string. Its geometrical outline is a sine curve and its analytical expression the sine of an angle.

Fourier, in his remarkable work on "The Analytical Theory of Heat," showed how any curve between certain limits may be represented by the sum of an indefinite number of sine curves.

"These trigonometric series," he says, "arranged according to cosines or sines of multiples of arcs belong to elementary analysis." This principle has had an extensive and fruitful application in every branch of physical science. Thus the temperature at any point of a heated solid body, the vibrations of a musical string or membrane, currents in an electrical conductor, the analysis of any curve like those given by the heart beats on a sphygmograph, or the record of a phonograph, are resolved by the same mathematical expression.

My colleague, Dr. Bevier, has used it in finding the different tones, the fundamental and its overtones, present in the utterance of each vowel. He can tell you just what notes you must sing at one breath in order to say Ah!

This method is so powerful that if it should be applied in the political world to the recent "tidal wave" no doubt it could show what measure of influence to ascribe respectively to the personality of ex-President Roosevelt, the cost of high living, the desire for a change, and the other factors.

Machines have been devised for effecting these processes mechanically. Lord Kelvin, Sir William Thomson, invented a tide-predicting machine of wheels, pulleys and cylinders, which, when properly set for the component waves, ran off a year's curve in about twenty-five minutes.

Conversely we have harmonic analyzers, by means of which, from the observed annual tide-curve the wave due to each inequality in the sun's or moon's motion has been determined with almost astronomical accuracy.

Time will not allow me to speak of Darwin's theory of tidal evolution which accounts with some degree of probability for the origin of the moon as parted from the earth and removed

to its present distance by the action of tidal forces, nor of his explanation through tidal friction of outstanding irregularities in the planets and their satellites.

In short, any line of inquiry diligently and thoroughly followed leads to developments, unexpected and important, diverging into many branches and yet converging toward the unity of the sciences and a universal law.

"Since the ancients" (writes Newton in the preface to the Principia) "made great account of the science of mechanics in the investigation of natural things and the moderns (meaning his contemporaries of two centuries and a half ago) have endeavored to subject the phenomena of nature to the laws of mathematics I have in this treatise cultivated mathematics so far as it regards philosophy."

MATHEMATICS FOR ENGINEERING STUDENTS.

PROFESSOR ARTHUR M. GREENE, JR., RENSSELAER POLYTECHNIC INSTITUTE.

In addressing this gathering on the subject of "Mathematics for Engineering Students," I do not intend to mention much that is new, but rather to call to your attention certain matters which should be in the minds of those preparing men for entrance to our technical schools, and to various details which have come to my attention in the teaching of applied mathematics.

Mathematical Training for Engineers is quite different to an engineer from what it is to the mathematician. To the engineer these questions arise: "What is the best way to have this subject presented to the student so that he may be able to use it in his practice?" "What is the best way to present the matter so that the subjects studied may be retained by the student for use in his professional career?" "What branches of mathematics should be given to increase the ability of the engineer to solve problems arising in practice?" To the mathematician the questions are not so utilitarian or commercial; he is looking simply for the ability to reason and operate in the abstract field of science, and to this end he turns the attention of the student. The ultimate aim of the training in mathematics for the engineering student is to furnish him with a tool so that he may solve in a definite manner the problems which are to confront him. These problems are not given in text-books; in many cases there is nothing similar in previous practice, but the problem arises and a definite solution is required. The aim is to give such training that the engineer may derive a solution. For this his reasoning powers should be developed mathematically and he should have had such a thorough grounding in the studies taken that he may have these ready to apply. The aim then is to give the tools for the work and to train the worker to apply these when the need arises.

The subjects to be covered for this are of two kinds:

(a) Those which are to be used in daily work, and

(b) Those for the development of mathematical reasoning powers.

The first class includes elementary algebra, theory of equations, trigonometry, geometry, analytic geometry, calculus and differential equations.

The second class includes higher algebra, series, determinants, geometry, the application of calculus, and analytic geometry to more advanced problems and differential equations.

In the training of engineers, there should be the endeavor to study as many subjects from each of these classes as possible. All of class (a) are necessary and all of class (b) should be given if we are to train our students to be thinkers. These should be taught in such a manner that the aim of the work is evident to the student as he progresses in the course, and moreover the aim should be clearly understood.

The preparation for the work in the technical school should include arithmetic, algebra, geometry and trigonometry. These subjects should be made as vital as possible by applying them to many practical problems. The work in arithmetic should include a thorough grounding in the four fundamental operations with methods of checking results. These operations are the ones to be used in the daily work of the engineer and facility in handling and checking will aid him. The use of fractions and decimal equivalents should be so taught that the relations between these two systems are clear and these relations should have a definite meaning to the student. Percentage and interest with denominate numbers should be taught and there should be little or nothing done with bank discount, partial payments, proportion and such subjects. Some of these will be studied anew in the business college or at the commercial courses in high schools and are much clearer after algebra is taken. Few students who do not go to higher schools have any use for these subjects, and it would be far better to go with more detail into the fundamental operations which are as necessary to the salesman, draftsman, or mechanic as to the engineer. The particular subjects of applied arithmetic are of little or no value to the pupil and are forgotten immediately.

In the preparation in algebra, the fundamentals again should be thoroughly given and the pupil should work out a great number of examples illustrating the operations of addition, subtraction, multiplication, division and factoring, after which there should be a drill in problems teaching methods of reasoning as well as grounding the students in the principles of algebra. These methods should be accompanied also by the study of geometry, both plane and solid, with considerable drill in "originals" for

training in the methods of application of geometry to the proof of certain facts. This training in the rigid proof of given relations is one of the best drills for any pupil and especially for the prospective engineering student.

At this time the study of proportion and the "rule of three" can be taken up with profit and ease. All kinds of problems can be given and it is not now a matter of rule only with little reasoning but the solution of a problem, worked out in a logical order. The boy has now reached the point where he can grasp the reasons for the various steps taken and take them himself.

The technical school is confronted with two different questions at this point: First, shall the preparatory school give trigonometry and higher algebra, and so give more time in the technical course for advanced work, and, second, shall the technical school give these courses in their regular curriculum and eliminate the possibility of certain applied work early in the course so that the work in mathematics may be given in such a manner that the future work of the course can be built on the preparations with good results? It is a serious question and is solved by different technical schools in different ways. Some schools start with college algebra and trigonometry, while others give analytics and calculus in the freshmen year.

Until within the last few years, the high schools did not prepare their students properly in these subjects, and it was really necessary to give these subjects in the technical school if future work in mathematics was to be carried on properly. The conditions to-day are better, but still there is great need of a more intimate knowledge of these subjects by the pupils of the high schools. The improved condition has been obtained by the better grade of teaching, and the fact that there is a desire on the part of the high schools to co-operate with the college. Until, however, the teachers in the high schools are willing to give an extensive drill in these subjects, making the work more real and going into the fundamental parts so that the development of the science is clear, it will be necessary for the engineering schools to teach them.

Entering the technical school the student carries further the mathematical work of the high schools. Advanced algebra and trigonometry are given, followed by analytics, calculus and differential equations. These courses are given as pointed out for

two purposes; first, the development of mathematical reasoning powers, and, second, the development of tools with which the engineer may solve problems. For these two ends the course must be under the direction of one skilled in mathematics, and, at the same time, one who can illustrate by constant example, the application of the theorems to actual engineering work. This work can be given by either the mathematician or the engineer, for each mind will bring to the student something of value, and, if both minds can be combined in one, the student is greatly benefited. The great trouble with much of our technical school work in mathematics is the lack of practical application, which causes the average student to take a small interest in the work. To the best men of a class the beauties of the work appeal, and they may read between the lines and see to what results a given theorem will lead, but to the average man the theorem proven is simply the accomplishment of one further task.

As before stated in connection with the work in the preparatory school, the student in the technical school should have many chances to apply theorems to problems taken from actual life, problems which have a definite significance in everyday affairs and which will give a vital aspect to the subject. Of course, for instance, there may be little in the subject of conics which can be taken from daily life to illustrate the drawing of tangents or polars, but there are some applications which can and should be made. The object of the study of analytics is not quite the same as that of calculus or of algebra, it is more nearly allied to geometry, and serves to train one in mathematical methods of reasoning along analytical lines, and hence its objects may be attained by problems not drawn from practice.

In any case, general methods in all of these subjects should be used, and, in addition, alternate methods, short cuts and check methods should be given.

Having finished the preparation, the application of mathematics is now taken up in surveying, geodesy, railroad curves, mechanics, strength of materials, thermodynamics, electricity and magnetism, physics, chemistry, hydraulics, engineering economics, etc. In this work the application should be made by a man specially qualified in the branch of engineering in which the application is to be made. The work should be done by an engineer, physicist or chemist, and not by a mathematician. It

is the great aim of the engineering school to turn out a large proportion of the students as competent engineers, and to do this they must have a rigorous drill in the applied mathematical subjects so that everyday problems are really a part of their lives. This drill, this constant repetition of the things which are to come up in daily life, can only be given by those who know from actual experience what these things are. It is of greater importance to the engineer to have at his fingers' ends the expressions for bending moments on different beams, and to know how to find these quickly and to use them properly, than to know how to find the path of a projectile subject to a number of conditional forces. The things which rightly appeal to the mathematician are not those which appeal to the engineer, or those with which he will have to deal every day. My point is this: The engineer may learn from the projectile problem a method to attack a certain problem which may come for solution once in his career, while the time spent in this problem at school could have been better employed in grounding him in the work which he will have to do many times as soon as he leaves the technical school. The work in advanced theoretical mechanics, or kinematics, potential functions, spherical harmonics, while important and valuable, have less value for the ordinary graduate than the simpler matters, which must be given to prepare the student for a designer or constructor.

The work in mechanics, in thermodynamics or in the theory of electricity demands the constant use of all of the work in mathematics as given in the lists mentioned earlier, and in this the aim of the teacher should be to use the work of the department of mathematics so that the student may see how to apply the theorems studied. In this way the real value of the calculus and algebra may be made evident. Many times have I heard engineers say that they have had no use for calculus since graduation. This is a reflection on the teachers of mathematics and on the teachers of engineering. There are many problems arising in practice which may be solved simply and quickly by the use of higher mathematics, and these the engineer should use if he is worthy of the name. By constantly drilling the men in the applied courses in the use of the subjects studied in their mathematical courses, these subjects become so familiar to the student that he has the natural inclination to turn to these methods in the future.

The necessity of the use of calculus and other branches of higher mathematics is evident to all of you. In many cases discussions or problems which cover pages of text when solved by geometry or by simple approximate methods are reduced to less than three lines when handled by a more advanced method. Of course, this matter can be carried to an excess, and the more advanced method should not be used when a simpler proof may be obtained by a more elementary process. It is very foolish to multiply three by four by logarithms or the slide rule, yet the student using these aids will proceed in that manner unless specially drilled not to do so. In all cases the aim of the teacher should be to have the student seek as simple and direct a method as possible. The constant use of higher mathematics, applying the various theorems, fixes these matters clearly in mind, and makes possible a use of methods of solution more exact than the cut and try methods.

In passing, I would like to call the attention of the teachers of mathematics to the great value to the engineer of graphical methods and approximate solutions of problems. In many problems a graphical method will yield a result, or the first approximation to the result, which will save time. Hence, it is well to show, early in the work in mathematics, how curves may be plotted and used; what is meant by graphs and what these will give.

The questions of accuracy and speed should receive considerable attention from teachers in the preparatory schools, as well as in the colleges. Accuracy is the most important acquirement in mathematical work and after this follow speed and neatness. To make the student acquire accuracy his work should be carefully checked by the instructor, and, in addition to this, he should be trained to apply various checks to his work. With this the ability to do work rapidly and in a methodical manner should be sought for and by the extensive use of problems these two objects may be attained. That they are of great value to the engineer is evident to you all, and the young engineer who has the ability to do his work accurately and with rapidity in such a manner that it may be turned over to any one to check is sure of success.

The study of a great number of subjects superficially rather than fewer subjects thoroughly is to be avoided. The effect of this on the student of engineering who has to know what he uses

is bad. To give him a superficial knowledge of mathematical subjects would be only to burden him with unnecessary matter, for he would not be able to apply much of it. I am a firm believer in the statement that to be able to handle any branch of mathematics one must know that branch and know it well. I believe in thoroughly teaching a few subjects, because then the young engineer is not misled into thinking that he has something that he can use when the reverse is true. Our training should be such that, whenever a need arises, the engineer knows how that need can be met with the mathematical tools at his disposal. A thorough understanding of his work in mathematics will give to a student a knowledge of the limitations of the science, and he is saved the trouble of endeavoring to make an application which is an impossibility. Superficiality is to be guarded against in the practce of engineering, and if we who have the training of engineers in our hands permit a superficial training, this will react in the character of the engineers going out from us.

The value of elective work during a course in engineering can not be overestimated. The curriculum of the engineering school is, in most cases, a special one, in that the various courses are added for a specific end, the production of a man who is prepared to enter any field of engineering, and by a moderate amount of extra work fit himself for the demands of that field. To do this in four years, after the high school course, consumes practically all of the time available for the ordinary student. For the best students, however, there is some time for elective work, and time spent in the study of some higher branch of mathematics will prove of great value to them. Such subjects as determinants, differential equations, spherical harmonics, elliptic functions, potential functions, number theory, function theory, quarternions or vector analysis, all have great value to the engineer if he can find time to do any work on them. These studies will aid him in furnishing him with more tools for work, but the greater use is in the mental training in methods of attack of specific problems. That these can not all be taken is manifest, but I thoroughly believe that if the young engineer could follow by himself one mathematical course each year, in addition to the special technical reading along the line of his specialty, his value to himself as well as to his employer would be greatly increased.

The main points which I have brought forward in the teaching of mathematics are these:

Courses in which thoroughness is sought in a few subjects rather than a great breadth of work. A constant drill and repetition of what is done so that it becomes a part of the student's make-up, a training in accuracy, followed by neatness in arrangement and speed of work.

The courses in pure mathematics are to be given by mathematicians, or engineers, but in either case by men who know the future applications of the studies. The applied mathematical subjects to be given by engineers, who draw constantly from practice for problems and illustrations. The teachers in both cases are to be enthusiasts, and by example and precept compel the student to constant work and instill a desire to master the subject.

GENERAL DISCUSSION.

MR. FLETCHER DURELL, LAWRENCEVILLE SCHOOL:—In the papers that have been read, I think that we may observe a tendency toward a central position. On the one hand we have the admission, or the statement, that the old purely formal view of higher mathematics as a disciplinary subject is passing away, and that at least we all want a more practical content in the details and problems of mathematics; and, on the other hand, we have the statement that the engineering topics or branches of mathematics should be taught in a broad and liberal spirit, their interrelations clearly shown, and the cultural meaning of each subject brought out.

Now, I want briefly, in a few remarks, to define and emphasize this somewhat central position from a little different point of view.

In considering the cultural and technical utilities in mathematics, it has been remarked that some persons regard mathematics as a goddess, and that others regard her as a most excellent cow. The view which I personally hold is this: If we serve mathematics faithfully and intelligently, we shall not only find her a goddess and receive her blessing as such, but shall find that our goddess also owns a whole herd of cows.

Bread and butter utilities sought immediately and by narrow means are piecemeal, haphazard, and dwarfing. The sure, reliable and thorough way to get gastronomic utilities (and, of course, these are of prime, though not exclusive, importance) is by fundamental and abstract means. The ideal is not the ideal alone; it is the choicest real. The theoretical is the fundamental and comprehensive practical.

One difficulty in the matter is that the connection between cultural and current concrete values has not been definitely worked out and put in manageable shape. This connection has been left largely to take care of itself in the form of accidental and haphazard processes, such as filtration, induction and sedimentation.

It is worthy of note that our two greatest Americans, Washington and Lincoln, were students of mathematics in a special way, and that both were land surveyors at one time. Washington surveyed to such good purpose that by the lands which he acquired while engaged in this occupation he became the wealthiest man in America. It is a noteworthy fact, also, that in carrying on his military campaigns he had accurate surveys made of all the regions in which his army marched and fought. I have in my possession a photograph of a portion of one of these maps, which includes the village of Lawrenceville, in which I live, with the buildings in the village inscribed, their character being noted and the names of their occupants. This map is like a steel engraving in its accuracy and finish. Is it not probable that the fact that Washington and Lincoln were both land surveyors has some connection with the fact that they were able to survey the needs and opportunities of the nation in such a broad, far-seeing and dispassionate way as shown by Washington in his farewell address and Lincoln in his second inaugural.

Now we are able by use of mathematics to make surveyors and engineers to order, so to speak, but we are not able to make Washingtons and Lincolns (or anything like them) except in a haphazard and accidental way. We can with some certainty and exactness teach pupils to survey land, but not with the same certainty to survey the nation or current civilization.

In the present agitation for bread and butter studies and methods of education as compared with cultural ones, what the people want is not so much more broad and better studies necessarily,

as that they want to know definitely what the so-called abstract and cultural values are; they desire that these values or utilities be analyzed into more fundamental elements and units, and be put in a more manageable shape so that, for instance, we can give a boy more or less of one or another of them, according to his need or capacity; be sure to make a Washington or Lincoln, if capacity is in the boy; if not, have definite means of making him the brightest and best he is capable of.

Because we do not have this power, the present tendency is for people to prefer one good cow of technical or bread and butter utility in the stable to a whole herd of cattle hidden in far off woods, only one of which we stumble over occasionally, and even to the dimly heard rustling robes of a far off goddess.

Now this problem of putting both the cultural and vocational values of mathematical study in a more fundamental and manageable state (so as to reap both of them in the largest and most vital way) is, of course, a large and difficult one. All I can hope to do at this point is to offer a fragmentary suggestion or two by way of illustration.

The first, and, perhaps, most inclusive suggestion that I would make is that we need more fundamental categories of utility than are in common use in this connection; more fundamental categories, for example, than the terms mental discipline, power of logical and accurate thinking, mental clearness, etc.

For instance, in life and work, both cultural and vocational success consists largely in power to use auxiliary quantity, to co-operate in the largest way with other persons, forces, ideas. This is more than clearness and correctness. It is the source of aggressive power in the largest way. Thus, for instance, the engineer depends for his success on the use of auxiliary objects in the shape of tools, machinery, water, coal, the forces of nature, other men, the ideas and experience of other men. Not less do the farmer, merchant, teacher, lawyer, all active and progressive men, depend on auxiliary entities of many kinds. The use of these aids in definite complex ways is what distinguishes man from the animal. The difficulty in our attempts to master these aids and forces is that, ordinarily, we take up these auxiliaries as too large and complex aggregates, often full of personal error and bias, and hence, necessarily, left to chaotic and haphazard development. Now the study of geometry, for instance, affords

us a means of acquiring mastery of auxiliary quantity in a progressive systematic way (1) by beginning with aids in very simple forms, as a single line or angle, and of passing gradually on to more complex forms.

(2) By beginning with natural aids within the domain treated, and passing on to aids without this domain, and then to artificial forms.

(3) By the impersonal material which it supplies, free from entanglements of passion or prejudice.

If by proceeding thus we acquire a definite and manageable power over objects, we acquire a power which has both concrete practical, and ideal applications every day.

Hence, even for the engineer, this utility in the study of geometry is more valuable than the knowledge acquired of particular geometric thereoms and their technical applications.

Other similar illustrations of the idea which I am trying to present might be drawn from the field of geometric study, as the ability which such study gives to perceive the vital essence of a situation, and to discriminate the essential from the superficial.

A second vital and widely usable utility inherent in mathematical study lies in a broader grasp and application of the meaning of symbolism which such study may give. Take this illustration: A certain firm which occupied, say, 10-20 Barclay street, in a certain city, as their place of busines, in advertising in one magazine gave their address as 10 Barclay street; in advertising in another gave it as 12 Barclay street; in a third as 14, etc. Hence the replies could be grouped by the addresses on them, and the relative returns from the advertisements in the different magazines accurately determined. In other words, the symbolism which indicated the place of business of the firm at the same time automatically registered a part of their correspondence in a profitable way.

Similarly, if I have three or four sets of papers which I want to use together, yet keep distinct, I can keep them distinct by placing them upon each other at different angles. The difference of position is made a symbol for difference of quality or relation, a principle which has daily applications of many orders and kinds, as, for example, in the notable instance of our positional system of notation for number.

The two kinds of utility which I have mentioned interact, and

for this reason also give results, not merely of local, but of pervasive usefulness. Thus the use of symbols aids in the use of auxiliary quantity. A friend of mine had a debtor of doubtful solvency who owed him $100. After some effort my friend obtained a check for $100 from his debtor. On presenting the check at the bank he found that the balance on deposit to the debtor's credit was only $90. My friend had studied quadratic equations in algebra, so he completed the square by depositing $10 to the credit of his debtor, had his check cashed, and made $90 by the operation. In practical life we do not often need to complete the square in the technical algebra. But we frequently complete the square in that we are constantly combining our work with that of others in order to get a broader basis of life and a more effective grouping of relations. This convention, for instance, was not assembled without completing the square many times.

When in the analysis of a mathematical problem we use several symbols to represent unknowns, we are using these symbols as a means by which to grasp all the data of a problem, and thus be able more intelligently to get the most fundamental and advantageous starting point, and work from it in several directions at once. This is something which we all need to do many times each day, both in vocational and cultural lines, and a good study of the algebra of simultaneous equations should aid in getting a right and vital start in acquiring power to do this in the most efficient way.

Similarly the fundamental laws of algebra are essentially the fundamental laws of arranging and grouping objects of any kind. Hence, on this side the study of algebra, rightly understood, becomes a training for so definite a vocation as bookkeeping (which is essentially a process of arranging, grouping, and cross-grouping) or, more generally, a training in organization or system making of any kind.

Similarly I might point out and illustrate the fact that the study of mathematics in an adapted way is fitted to give in unit, elemental progressive way powers of reuse of what we know, and of directive use in general; of perception of uniformities and differences with all their resultant values; of perception or creation of units and multipliers in all fields. All of these principles are widely and fundamentally useful in both vocational work and cultural life.

In brief, may we not find that our goddess has at her command, not only a herd of cows, but also a number of servants and ministers of an order far higher than the bovine? At the same time, be it ever remembered she is herself something above and apart from what she possesses.

Perhaps, before closing, I should mention one other aspect of this matter. The educational functions of mathematical study of which I have spoken are of such a nature that the question arises whether some other study may not give these results in larger measure and with greater ease than mathematics. Can not we conceive, for instance, of a philosophy, science and art of utility, practicality and efficiency, or of methods of attaining results, which will supersede mathematics in the respects which I have tried to emphasize, and form a fundamental study in all lines. Well, if so, I feel sure that we would all welcome such a study. At the same time we may feel confident that in such a study, mathematics or mathematical concepts will always form an important and essential part.

SECOND SESSION

Friday, November 25, at 2.30 P. M.

PHYSICS FROM THE COLLEGE POINT OF VIEW.

PROFESSOR WILLIAM E. FRANKLIN, LEHIGH UNIVERSITY.

In a recent article* on the distinction between the liberal and the technical in education, my friend and colleague, Professor Percy Hughes, says that in speaking of an education as liberal we thereby associate it with liberalism in politics, in philosophy and theology, and in men's personal relations with each other. In each case liberalism seems, fundamentally, to denote freedom, and liberalism in education is the freedom of development in each individual of that character and personality which is his true nature. All this I accept in the spirit of an optimist, assuming men's true natures to be good, but I do not, and I am sure that Professor Hughes does not, consider that technical education, unless it be inexcusably harsh and narrow, is illiberal; nor that liberal education, unless it be inexcusably soft and vague, is wholly non-technical. The liberal and the technical are not two kinds of education, each complete in itself. Indeed, Professor Hughes speaks of liberal education, not as a category, but as a condition, a condition which makes for freedom of development of personality and character.

It seems to me, however, that there are phases of education which have but little to do with personality, and I call to your attention this definition of liberalism in education, in order that I may turn sharply away from it as a partial definition which, to a great extent, excludes the physical sciences. Indeed, I wish to speak of a condition in education which is the antithesis of freedom. I wish to explain the teaching of elementary physical science as a mode of constraint, as an impressed constructive discipline, without which no freedom is possible in our relations with physical things. I wish to characterize the study of ele-

*Popular Science Monthly, October, 1910.

mentary physcal science as a reorganization of the workaday mind of a young man as complete as the pupation of an insect; and I wish to emphasize the necessity of exacting constraint as the essential condition of this reorganzation.

In order that I may be able to explain to you the character of this reorganization, let me distinguish two chief results of the scientific activity of the last half-century, namely, (1) an accumulated mass of fact under which heading I would include all of the details of modern industry, for, indeed, the most important and compelling facts that have been accumulated by the sciences are the facts that are incorporated in the settled doings of men; and (2) an established mode of thought and inquiry which may be designated, using a suggestive phrase of Bacon's, as "A New Engine, or a help to the mind corresponding to tools for the hand."

We continually force upon the extremely meager data obtained directly through our senses an interpretation which, in its complexity and penetration, seems to be entirely incommensurate with the data themselves, and we exercise over physical things a kind of rational control which greatly transcends the native cunning of the hand.

For example, an astronomer listens to the beats of a clock as he watches a spot of light move across the field of his telescope, and then he takes the reading of a divided circle. This he does three times in succession, listening to the ticks of a clock and looking at coincidences of lines; and from this data he determines the orbit of the spot of light (a comet) around the sun, predicting when it will come nearest to the sun and how far away it will be, when it will return, and so on.

The possibility of this forced interpretation and of the rational control which we see exemplified everywhere about us, depends upon the use of the two complexes, (a) a *logical structure,* that is to say, a body of mathematical and conceptual theory which is brought to bear upon the immediate materials of sense, and (b) a *mechanical structure,* that is to say, either a carefully planned arrangement of *mechanical devices,* and or a carefully planned *order of operations.* We see carefully planned mechanisms used in every branch of science and in almost every application of science to daily life. A good example of a carefully planned order of operations is that which is followed by the

chemist in his work of solution, reaction, precipitation, filtration and weighing; and ordered operations of this kind are performed in almost every application of chemistry to industry.

These two structures, namely, the logical structure and the mechanical structure of the physical sciences, do, indeed, constitute a new engine which helps the mind as tools help the hand, and the study of elementary physics is intended to lead to the realization of this new engine (1) by building up in in the mind the logical structure of the physical sciences; (2) by training in the use of devices (especially of measuring devices) and in the performance of ordered operations, and (3) by exercises in the application of these things to the actual phenomena of physics and chemistry at every step and all the time with every possible variation.

This surely is an exacting program; but compromise is impossible. The only alternative is to place the student under the instruction of Jules Verne, where he need not trouble himself about foundations, but may follow his teacher pleasantly on a care-free trip to the moon, or with easy improvidence embark on a voyage of twenty thousand leagues under the sea. Let no one imagine that the study of the elementary physical sciences is an unconstrained mode of activity. It is liberal only in its promise of power; it is not liberal in the sense of offering freedom in its pursuit. Even the freedom to let it alone seems to be taken from us by the necessities of our daily life.

Every person I have ever talked with, old or young, theorist or practician, student-in-general or specialist in whatever line, has exhibited more or less distinctly a certain attitude of impatience towards the exactions of this or that phase of the precise modes of thought of the physical sciences.

> "Da wird der Geist Euch wohl dressiert
> In spanische Stiefeln eingeschnuert."

But precise ideas are necessary. Herein lies the impossibility of compromise in the teaching of the physical sciences and the necessity of constraint. One must think so and so, there is no other way. Nothing, indeed, is so essential in the acquirement of a solid knowledge of physical things as the possession of precise ideas; not because a perfect precision is necessary, or even helpful, as a means of retaining knowledge, but that *noth-*

ing else so effectually opens the mind to the perception even of the simplest evidences of a subject.

I think I can explain to you further the characteristics of physics study by mentioning the chief difficulties in the teaching of elementary physics. One is that the native sense of most men is wofully inadequate, without stimulation and direction, for the supply of the sense material upon which the logical structure of the science is intended to operate. A second difficulty is that the human mind is so in the habit of considering the practical affairs of life that it can hardly be turned to that minute consideration of apparently insignificant details which is so necessary in the scientific analysis even of the most practical things. Every one knows the capability of the Indian for long-continued and serious effort in his primitive mode of life, and yet it is difficult to persuade an Indian "farmer" to plow. Every one knows, also, that the typical college student is not stupid, and yet it is difficult to persuade the young men of practical and business ideals in our colleges and technical schools to study the abstract elements of science. Indeed it is as difficult to get the average young man to hold abstract things in mind as it is to get a young Indian to plow, and for almost exactly the same reason. The scientific details of any problem are in themselves devoid of human values, and this quality of detachment is the most serious obstacle to young people in their study of the sciences.

A third difficulty, which, indeed, runs through the entire front-of-progress of the human understanding, is that the primitive mind-stuff of a young man must be rehabilitated in entirely new relations in fitting the young man for the conditions of civilized life. Every science teacher knows how much coercion is required for so little of this rehabilitation; but the bare possibiilty of the process is a remarkable fact, and that it is possible to the extent of bringing a Newton or a Pasteur out of a hunting and fishing ancestry is, indeed, wonderful.

A fourth difficulty is that the possibility of this rehabilitation of mind-stuff has grown up as a human faculty almost solely on the basis of language, and the essence of this rehabilitation is the formation of ideas; whereas, *a very large part of physical science is a correlation in mechanisms.*

Many of our teachers, especially those who handle the mathematical sciences, seem to think that ideas can be built up in the mind of a young man by a sort of hocus-pocus out of nothing,

but ideas, like everything else in this world, must be made out of something. All elemental knowledge, such as the knowing how to throw a ball, how to ride a bicycle, how to swim, or how to use a tool, seems to be locked in the marginal regions of the mind as a very substantial but very highly-specialized kind of intuition, and the problem of teaching elementary physical science is, in part, the problem of how by suggestion or otherwise to drag this material into the field of consciousness, where it may be organized into a generalized logical structure. A formal and abstract presentation of the principles of elementary physics tends more than anything else to inhibit the influx of this elemental material into the field of consciousness, and results in the building up of a theoretical structure which can have no traffic with any mental field beyond its own narrow boundaries. Such a state of mind is but a kind of idiocy, and to call it a knowledge of science is silly scholacticism.

The best way to meet the quadruply difficult situation in the teaching of elementary physics is to relate the teaching as much as possible to the immediately practical and intimate things of life, and to go in for suggestiveness as the only way to avoid a total inhibition of the sense that is born with our students. Such a method is certainly calculated to limber up our theories and put them all at work, the pragmatic method, our friends, the philosophers, call it, a method which pretends to a conquering destiny.

"We advise all men," says Bacon, "to think of the true ends of knowledge, and that they endeavor not after it for curiosity, contention or the sake of despising others, nor yet for reputation, or power, or any other such inferior consideration, but solely for the occasions and uses of life." It is difficult to imagine any other basis upon which the study of physics can be justified than for the occasions and uses of life; in a certain broad sense, indeed, there is no other justification; but the great majority of men must be practical in the narrow sense, and, I believe, very strongly, and in the narrowest possible sense that there is no justification for the study of physics by the average college student, other than for the occasions and uses of life. Furthermore, I believe that this narrow basis of physics study would bring about the healthiest possible condition in respect to the emergence and development and the continued productiveness of research specialists in physics.

At his sesquicentennial address at Princeton University fourteen years ago, Dr. Woodrow Wilson said that if he was not mistaken the "scientific spirit" of the age is doing us a great disservice, working in us a certain great degeneracy, and yet, says Dr. Wilson, I have no indictment against what science has done. I have only a warning to utter against the atmosphere which has stolen from our laboratories and lecture rooms and into the general air of the world at large. It is a noxious, intoxicating gas which has somehow got into the lungs of the rest of us, a gas which, it would seem, forms only in the outer air.

Now it is not easy even for one of Dr. Wilson's training to express himself with clearness and precision on a matter of this kind; and although I am completely in sympathy with what I understand Dr. Wilson's point of view to be, I do not like his use of the term "scientific spirit." The true scientific spirit, the spirit of such men as Kelvin and Helmholtz, is beyond criticism; but the great things such men have done have brought upon us the most distressing and stupid form of idolatry the world has ever seen, and the men who have the true scientific spirit are the only men, as a rule, who are free from it.

The results of science have fascinated the crowd, and almost hopelessly confused the boundaries between personal and impersonal things; and the great majority of men have adopted a scale of physical values for everything in life, "with a consequent neglect of quality and a denial of human value in everything. We have a philosophy of rectangular beatitudes and spherical benevolences, a theology of universal indulgence, a jurisprudence which will hang us rogues; all of which means, in the root, incapacity of discerning worth and unworth in anything, and, least of all, in man. Whereas, Nature and Heaven command us, at our peril, to discern worth from unworth in everything, and most of all in man.

Our real problem now, as always, is "Who is best man?" and the Fates forgive much—forgive the wildest, fiercest and cruelest experiments—if fairly made in the settling of that question. Theft and blood-guiltiness are not pleasing in their sight, and yet the favoring powers of the spiritual and material worlds will confirm to you your stolen goods, and their noblest voices applaud the lifting of your spear, and rehearse the sculpture of your shield, if only your robbing and slaying have been done in fair

arbitrement of that question "Who is best man?" But if you refuse such inquiry you will come at last to face the same problem wrong side upwards, and your robbing and slaying must then be done to find out "Who is *worst* man?" Which in so wide an order of inverted merit is, indeed, not easy; but a complete Republican Ring, and Lowest Circle in the Inferno of the Worst you are sure a last to find, and be governed by!"

It may seem ridiculous to you that the suggestion that I discuss two aspects of physics study, the cultural and the technical, should call forth a protest charging the majority of men with idolatrous stupidity and demoniac possession, but what Dr. Wilson calls the "scientific spirit" is, indeed, a dull-witted demon, whose indwelling is a certain ubiquitous idiocy. Culture, as it seems to me, is a quality of personality, and to adorn the personal chambers of the mind with the structure of the physical sciences is as absurd as to adorn a parlor with unused and useless pickaxes and posthole diggers.

If the question be whether the so-called cultural courses should include instruction in physics, I can only say, there is no education so bad, even if it is the worst to be had for money, which does not include a little that is impersonal, and there is no education so good, even if it is the best to be had for nothing, which does not include a great deal that is impersonal.

It is absurd to speak of the cultural and the technical aspects of the physical sciences. There is but one possible object of physics study, namely, to use it *as physics* in our dealings with physical things; in work, in general orientation, and in research; and I believe that these three uses of physics study could be realized to the greatest possible extent if high school and college physics were devoted primarily to the rationalization of living conditions and the rationalization of work. The only differences now existent in the presentation of physics to high school and college students are the difference of more or less, the vanishing difference between what is sound and what is unsound, and wide differences of method and emphasis, with a consequent range of degrees of futility, whose absolute zero is inconceivably, infinitely below the conventional zero of those who still pretend to teach science for its own sake.

THE PURPOSE OF AN INTRODUCTORY COURSE IN BOTANY

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One's notion of the purpose of an introductory course of study in any subject must follow logically from his conception of the purpose and nature of education in general, and of the immediate aim of the various grades of formal instruction, commonly designated as primary, secondary and higher. These are very broad and very fundamental questions, and I would not, by any means, presume to attempt a discussion of either of them within the limits of a twenty-minute paper; but I will attempt a concise statement of my own views, as a possible justification of what I hold to be the primary purpose of an introductory course in botany.

The point I wish to emphasize with reference to the purpose and nature of education is the necessity of keeping clearly in mind the distinction between education and information, and between education and training. Here it is almost impossible to avoid the commonplace, and I make no claim to originality. Most of us recognize, at least theoretically, that information and education are not synonymous. Information is a possession, education a process; the posession may exist outside of and apart from the individual, but not so with the process. It begins anew with the mental life of every one of us, and continues through life with every experience. One's information is an index of what he knows, while one's education measures his power of accomplishment, of constructive thinking, of appreciation of relative values, the breadth of his view, the width of his sympathies, the fullness of his realization of self.

We all recognize, also, the difference between education and training. Training enables us to do certain things in a prescribed way, to solve old problems or meet definite situations in accordance with the past experience of others and our own special teaching. Education enables us to formulate independently ways of solving new problems, makes it possible for us to meet and master entirely new situations, and confers power beyond the limits and limitations of our teaching. Training has refer-

ence to the range of interest one already has, while education enlarges the scope of one's interests. Training confers skill within the limits of one's outlook, education enlarges the outlook. Training, in the large, has reference to one's chosen work, while education enables one to know what that work *ought* to be.

Concerning the formal grades of instruction, I conceive that primary education concerns itself chiefly with the tools of education. How to read, how to write, how to use numbers and their symbols, these are the fundamentals of primary education. Upon the mastery of these things depends the ability of the pupil to avail himself of the intellectual heritage of the race, and to contribute to its advancement.

Equipped with the needed tools the pupil passes into the grades of secondary eduaction. Here the aim is twofold. First, to guide him in the acquisition of useful information over as wide a range of knowledge as is practicable, considering his age and the avilable time; second, and most important of all, to open the eyes of the pupil to the numerous phases of intellectual activity, to give him glimpses of the various departments of knowledge, to broaden his mental outlook. And this for what purpose? Not so much for the sake of the information he may gain, but primarily to bring him in touch with a wide range of interests, that he may discover himself, and realize as early in life as possible what it is that makes a stronger intellectual appeal to him than all else together. To some this discovery comes early in life, to others it never comes at all, and these, if wise, sense the fact that, for them, success in life lies outside of those occupations that are primarily intellectual. For such the opportunity lies open of becoming useful citizens by engaging in busines or in manual labor.

The aim of higher education is primarily to offer an opportunity for perfecting one's self in one's chosen life work, culminating in original investigation and contributions to human knowledge and culture.

Now, of course, it is superfluous to state to this audience that these three grades of formal instruction are not sharply delimited. The primary pupil, while mastering the tools of education, acquires some knowledge and a wider mental horizon; by being read to, before he himself can read, his mind should be richly stored with a wealth of the best to be found in litera-

ture of all kinds, within the range of his comprehension, and a taste cultivated for only the best. In the secondary grades comes an increased mastery of the tools; and an introduction to new realms must necessarily form a part of the "higher" education, sometimes because the learner was not previously mature enough for an earlier introduction, or again because there is not time to present them all within the period of secondary schooling. But the things above mentioned are what give the distinguishing characteristics to the various grades of formal education: acquisiton of intellectual tools in the primary, opportunity to discover one's self through introduction to the various knowledges in the secondary, and, beyond this, unlimited opoprtunity for self-realization in the intellectual realm which has made the strongest appeal.

I have referred above to that considerable body of youth to whom a chiefly intellectual career offers slight attractions. These will enter various trades or lines of business, some as stenographers, some as plumbers, some as practical farmers, electricians, and so on. And happy for them if they discover, before it is too late, that in such occupations lies their straightest road to success and happiness. What a burden we are under in trying so often to make doctors of merchants, artists of artisans, teachers of factory operatives. Our larger universities to-day are literally clogged with students carried there by a too strong current, and to whom the college would render its largest service by a notice that they ought to seek a life-work along other lines. Here is the place and opportunity for the institutions for training, such as the so-called business "colleges" and trades schools; and a most important, and useful, and noble work it is.

With these preliminary and fundamental ideas in mind, my conception of the primary purpose of an introductory course in botany may readily be inferred. Negatively stated, I conceive it not to be to make botanists, not even primarily to impart information about plants. The purpose is not to prepare the pupil to take advanced courses in botany, though if the first course is properly taught such preparation will be accomplished. Still less do I conceive it to be a legitimate purpose of the introductory course to become a superficial introduction to horticulture, or agriculture, or any other applied science.

This, I take it, is the essence of the whole question of the practical *versus* the cultural: is the aim of public education primarily to confer or increase earning capacity, and are the content of the curriculum and the topics of each course to be determined chiefly with reference to that aim? In other words, is public instruction to be commercialized and education to become synonymous with information and mere training for a vocation? Emphatically, no. As Professor Bergen has well said:* "Leaving out business and other technical courses, however, when one begins to make economic consideration the measure of educational values he begins to pile up absurdities." In the introductory course in botany there is no more reason for supplanting purely botanical topics with topics chiefly horticultural or chiefly agricultural, merely because horticulture and agriculture have to do with plants, than for teaching pupils the location and names of the various cuts of beef when the zoology class takes up the subject of mammals, or of instructing the boys in the physics class in the art of wiring houses when the subject of electric currents is reached. Forestry is a relatively new profession of increasing importance, and the country greatly needs trained foresters; but the elementary principles of forestry should find no place in an introductory course in botany, in either high school or college.

By this time the "practical" man in my audience is restraining himself with difficulty. Does it make no difference, then, he asks, *what* we teach? Shall the information to be imparted be chosen with no regard to its utility outside of the school room? By all means, provided you do not give too narrow a content to the term useful. The study of Choctaw, to be sure, would have cultural value, but it could not well replace Latin or French; addition is more important than cube root; but our problem is not always as simple as this.

The all-important and fundamental principle, not only to be acquiesced in theoretically, but to be acted upon, pragmatically, if you please, is that, apart from the question of trades schools of various sorts, the main purpose of secondary education, by and large, and of every introductory course, in high school or

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*Bergen, Joseph Y. *Some Fallacies of Botany Teachers.* Sch. Sci. Math. 9: 821. D 1909.

college, is to lay foundations for complete living, and not merely to equip young people to earn a livelihood.

There should, of course, be no studious attempt to avoid topics merely because they have an economic bearing; neither, on the other hand, should there be any studious attempt to reject all topics that do not. The manner of increase in thicknes of a tree-trunk is important knowledge for the forester, the structure of the plant cell is not; but if one had to decide on the exclusion of one of these topics from the introductory course I should unhesitatingly retain the latter. We should carefully avoid the distorted position of the mathematical specialist, who one day thanked the Lord that he had at last discovered something that could be of no possible use to anybody. We should, with even greater care, avoid the opposite extreme that only that which can be immediately applied in earning bread and butter is useful or "practical."

He would indeed be a poor teacher who would close the study of bacteria with no mention of their sanitary importance; the topic of variation and heredity with no mention of the value of such knowledge when applied in plant breeding, in obtaining new varieties of cultivated plants; the study of trees with no mention of their economic importance, or of the question of conservation and the opportunities for well-trained men in practical forestry, the study of root-tubercles with no reference to rotation of crops.

But the topics above mentioned should be introduced as incidental to the facts of pure botany; they by no means furnish the most weighty reason for including botany in the course of study, and should not appear in that light to the pupils.

The course has, in reality, been a failure if the pupil leaves it without a lively sense of the fact that plants are intimately related to his own life and that of his fellows, and that, in general, a knowledge of plants is usable knowledge. But if there were no such profession as forestry, if plants were never cultivated for food, if a living could not be made by agriculture, there would still be ample justifiaction for including botany in the high school and college curriculum.

I have omitted the question of the intellectual discipline to be obtained in the study of any inductive science properly taught. This alone is sufficient reason for introducing some

natural science, and herein lies one of the most important cultural values of botany, especially because it is here so comparatively easy to introduce experimentation. The republic needs men first, foresters, farmers, mechanics, secondarily. If our public schools are to meet this demand for men we must recognize, more clearly than is now done, how intensely practical is the cultural. To learn to observe accurately, and without prejudice, to record one's observations faithfully, to limit one's inferences to what his observations justify, these are some of the cultural results of botany properly taught, and these alone would justify its place in the curriculum.

But if the purpose of the introductory course in botany is to reveal to the pupil an additional intellectual realm, to let him know that there is such a science as botany, what are the important items in the content of the course? This is the practical phase of our topic. What is he to understand constitutes the aim and scope, and essence of the science? Not surely the details of structure of beans and dandelions; not the Latin names of wild flowers and trees. These are important, they may indeed become ends in themselves; but, so far as the introductory course is concerned, they are means to ends. It is the broad, foundation principles, the larger conceptions, reached and understood only by a study of the details of structure and function, that should be brought into the foreground as soon as possible and kept there. It is the breadth and mystery of the fundamental problems that will make the strongest appeal, give a substantial and permanent aspect to the subject, and make it seem worthy of devoted study. Observation of the motion of protoplasm will arouse curiosity, but the teacher is aiming at interest in vital activity; the anatomy of stems may be more or less dull, but it serves to illustrate the illuminating conception of the relation between function and structure; the fact that stems grow vertically upward while roots grow vertically downward is known without studying botany, but experimentally considered it leads to the important conception of adjustment to environment; that no two maple leaves are alike and that they are easily distinguished from oak leaves may be trite information, but the teacher sees in it a path to the subjects of variation and heredity; a knowledge of the details of sporogeny and fertilization in liverworts and ferns is not essential to either happiness or success, but it paves the way to an

intelligent understanding of the broader problems of reproduction and sex, which are of vital importance; the pupil studies plants of varying complexity, the teacher has in mind a conception of evolution; the larger aim is to know, if possible, what a plant really is, the ultimate goal is to lead the pupil seriously to ask himself the question, what is life, and what is the meaning of it all *for him*. These things indicate the objects of the introductory course, so far as its informational aspect is concerned, and the pupil should be led to feel that the mastery of details of structure and function is necessary and important in order to make any approach to the solution of these problems. The purpose of the introductory course should be to let the pupil know what the problems are, in order that, perchance, he may discover that his own mission in life will be fulfilled in endeavoring to help answer them. Herein, I should say, lies one fundamental difference between botany and nature-study with plants. In the nature-study the facts are considered for their own sake; in the science, facts are subordinate to principles.

Here again we see that the purpose of the high school course is not to prepare for college, nor that of the first college course to prepare for future electives. If the content of the introductory course is what it should be, and the method of teaching it correct, the problem of preparation for advanced work will take care of itself.

But while recognizing that the cultural is intensely practical, we should not fall into the eror of supposing that the practical is intrinsically or necessarily lacking in capacity for culture. The question of the cultural *versus* the practical is not entirely one of content, but of spirit also. It is not alone *what* topics are presented, but *how* they are presented. Subjects that have no utilitarian value may be presented in such a way as to have also no cultural worth. To secure, therefore, the largest cultural returns from the introductory course in botany does not necessitate the elimination of topics of vocational aspect; nor is the converse true, that the introduction of subjects having a commercial bearing is necessarily at the expense of the cultural, though the tendency may be in that direction. Recalling Milton's definition of education, we should always remember that botany must do its share toward fitting the pupil "to perform, justly, skilfully and magnanimously, all the offices, both private

and public, of peace and war." Other things being equal, the more usable of two facts in daily life has the stronger claim to a place in the course; its cultural value depends largely upon how it is presented. It is not *necessary* to sacrifice culture to usefulness or usefulness to culture. This is often lost sight of. Perhaps I may express my meaning more clearly by saying that we should not choose the topics of the course with the idea that we are to prepare the pupil to enter any particular vocation, but with the idea that we are to help him to know what vocation he ought to follow—or to avoid; and that we should treat all topics with reference to the pupil as a human being, rather than as an embryo botanist, or forester; as a member of society whose greatest need, next to efficiency in his own calling, will be largeness of outlook and sympathy with the ideals and work of others.

But all I have meant to say above is that the primary purpose of the introductory course in botany, whether in high school or college, is to aid in that revelation of the infinite to the finite, which is the ultimate goal of all education, to draw aside the curtain from a new corner of the pupil's unknown, that he may haply be given an additional interest in life, possibly be led to discover his major interest, and thus the field of his most successful endeavor; and finally that, in the form of a correct method of thought, he may be given an effective instrument to insure against failure. It is the educational rather than the vocational. These things I conceive to be the only adequate justification for introducing botany at all into the course of study. In essence they are cultural; could anything be more truly practical?

THE CULTURE ELEMENT IN BIOLOGY TEACHING.

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The old notion of culture was, in a measure, appropriate to the intellectual environment of the times. Those who possessed the knowledge of the successive eras held to themselves all there was of the best. Cultured men who followed after them, for the most part, planted their feet in the footprints of their predecessors, and were approved in so doing. The term culture was applied to them, because they fitted the accepted content of the word. They could be cultured without breaking out a single new path, or originating a single new idea. But what happened to the man who broke from the tradition of the past and manifested no particular interest in ideals which appeared to him to have no useful connection with human life in his present? The least unfavorable element in his reception was to be considered awkward and uncouth. If he aspired to know facts, doubtless his acquaintance with the crude materials of existence did give him a certain taint of boorishnes. The very radicalism of his career was enough to set him off in the minds of his conservative fellow students, perhaps as a crude engineer, a lover of smells and startling colors, a queer bug-hunter, or, as I once heard the term applied by a Harvard aesthete to an instructor in mechanical engineering, "the Professor of Pots and Boilers."

The pioneers in any movement are likely to appear crude to those who fit the environment their intellectual forefathers have made. Perhaps they are crude. Since the time of the first followers of Christ there have been many men of new ideas who, by their appearance, their trade, their manners, and their language, have jarred on the upholders of the approved schools. A most interesting phase of the attitude of the cultured man to the new boor is the failure to realize that he himself sums up, in his exquisite equipment, the notions of many scholastic ruffians who made trouble before him. I don't know of a better way to surprise the smug conservative than to call his attention to the fact that he is the sum total of all the successful radicalism of former days.

Perhaps we might agree that the culture of any era is break-

ing over into the era about the time the era closes, never entirely adapted to the times, but always adapting. I am prepared to accept the situation as I find it, and advocate the properly belated extension of the content of the term culture to include the understanding of how to adapt material conditions to the improvement of man's welfare on the planet. We have had a great deal of exclusive individualism in the concept of culture. The growing good-will and the social spirit of the present era are most briefly expresed in the phrase, mutual service. May not the notion of culture expand a little more rapidly and take in this quality, and keep in touch with the probable future?

One of the great lessons that a person may get from biology, not any biology, but properly taught biology, is the lesson of Life-Relations. I know that it is possible for a student to gather to himself a considerable body of facts about the structure of plants and animals, and have little or no understanding of the lives of the organisms. Secondary school biologists have been in practical agreement for several years that the study of the lives of organisms is the most interesting avenue of approach, and probably the best. But it is one thing to agree to perform an act, and another to forget old tricks. It is one thing to really intend starting about a reform in methods of teaching, and another to develop the requisite skill to handle fluctuating phenomena in such a field as life itself. And then, the secondary school curriculum gives so meager an opportunity to all biological subjects, sometimes nothing at all, except a little time to human physiology, seldom more than 200 hours to general biology, while giving 800 hours to Latin. We have grown used to this, not submitting, however, but waiting patiently for the overturning of the old ideas of culture, with the expectation that we shall be ready with something more in accord with modern needs to put in their places. Biologists are working hard to justify the inclusion of their subject in every high school course of study, classical, commercial, manual training, industrial and all, for we fail to see why a subject which may be made to teach how to live as well as about life, is not needed by the boy or girl in business, or in a trade, as much as by others who may drift into the learned professions. There are possibilities of the poorer paid workers needing it more.

It is not necessary here to call to mind the many phases of

biology which have a practical bearing on human life. We are all familiar with the enormous benefits that have come to the race through the researches in bacteriology, in scientific agriculture, in hygiene and sanitation, and in the new doctrine of conservation.

Nobody would undertake to cover all these fields adequately in a 200-hour course in biology, besides teaching life-relations and the processes necessary to a comprehension of the subject. The best we can hope to do is to present enough material to the minds of the pupils so that the ideas will be suggested by what they see.

This problem is not an easy one, as may well be imagined. The college course in biology divides itself at once into botany and zoology and each extends over two or more years. Even then there may be no call to mention hygiene or conservation, because few expect it of the college department of biology, yet. I am speaking of the old-line college and not of the agricultural college. The high school department of biology, on the other hand, in closer touch with the people, is being pressed constantly to make its work more practical, or more in accord with first one, then another, civic force. Boards of Health, Academies of Medicine and civic organizations of various kinds are periodically urging us to attack the problems which they believe to be important. Occasionally discontented private citizens jeer at our work because of what they believe to be a trifling use of time in our teaching. Their criticisms are usually unintelligent, we like to think, but we have to reach their children, as well as the children of those people who don't say anything. School officials, too, those whose training has been wholly classical, are likely to find fault with our sincerest efforts, chiefly because their training does not permit them to understand us. But most surprising of all in this the twentieth century has been the occasional opposition, in intelligent communities in the East, of ecclesiastical organizations that are sensitively fearful that we are trying to undermine the foundations of their belief.

Running counter to one or another of these difficulties, and responding to the just claims of organizations and movements outside our own, we have given an extraordinary amount of study to ways and means of working out the valuable features

of the subject-matter of biology, and to methods of presentation. In this we have broken away from the colleges in more ways than in the content of the course. We have done a great deal of experimenting with subject-matter and with methods, but we suffer for lack of a clearing house through which successful methods may become known to large numbers of teachers, and by which antiquated methods could be fittingly condemned. A clearing house of that kind might be established for all the subjects in the form of municipal, state or national experimental schools. Some subjects are being experimented with anyway, and the rest might be enlivened by a little variety; why not have the experimenting organized?

At the present time most biologists have agreed that no particular set of animals or plants are inevitably necessary to use in teaching the essential principles of biology. This is important, not only from a pedagogical point of view, but also from the point of view of ease of access. The city high school has its enormous field of biological relations induced by the crowding of people into small areas. Among these are: the relation to human life of disease-bearing organisms, the complicated but well-known interrelations between people working in their environment for a living, the activities of men in bringing supplies of food to others, the kinds of food men use, and the wonderful range of life-relations outside the city which render possible the supply of a city's food. The city boy may never feed or shear a sheep; he may never hoe a garden or run a threshing machine, but life would have more meaning for him if he understood the relation of these activities, and the organic activities back of them, to his own existence in the city.

Besides, there is the great civic-biological problem of the disposal of the city's waste. The conservation of the sewage in a city like New York would involve not only an enormous saving of the wasting natural resources of the country, but also a great saving in the health of the people. It is obvious that a body of citizens who have learned something of the principles of life-relations can attack a problen of that kind with understanding, and with the probability of success largely in their favor.

The high schools of the towns or small cities have nature itself, practically unimpeded by the somewhat difficult condi-

tions of city life. The country high school has nature at its front door, and at its back door and all around. And yet, only last year I read that a zoological expedition had gone to Puget Sound to collect starfishes and other marine forms to give to Kansas high schools for study. I also read that nature study in those schools needed stimulating.

We all know that radiates are scarce in Kansas, but there are insects galore, all busy, and there are many species of vertebrates in all the classes. There is a wonderful flora, and a marvellously fertile soil. So the trouble evidently isn't with the supply of material. As I hear reports of the study of nature in different parts of the country, I have about come to the conclusion that the trouble is never with the kind of material, but with the scarcity of ideas.

I have been hopeful that the nature-study idea, so-called, might really sink into the minds of teachers more generally. Apparently, high school teachers in biology in many regions appear to think it was not meant for their use, and they continue to labor over bilateral symmetry and the nervous system of the earthworm.

The lessons of Prof. Hodge's *Nature Study and Life* are full of practical suggestions, as well as points of view and ideas for any high school teacher in the land. If they are not enough, a casual analysis of the life-interests of any community will give any quantity of usable points of view. For example, a high school in a small town draws pupils from farms where various activities in plant cultivation and animal-raising are carried on. The sum total of scraps of information possessed by these pupils is very great. A teacher coming into the school with the necessary interest in the minds of young people, and with a comprehensive understanding of biological relations can help those pupils to see the interdependence of many conditions in the life of plants and animals which before stood to them as disconnected and possibly meaningless facts. And how dignified and worth while becomes some little fact through the interpretation given to it by science! I recall now the well-known fact that clover when sowed on exhausted soil will grow well and give the soil a new lease of fertility. I have taught farmer boys who knew this, and the very fact that I recalled something they knew made us kin. But their satisfaction was enhanced when they

learned what nitrogen-fixing bacteria have to do with the fact in clover and other leguminous plants. They were convinced and much impressed by the results of experiments carried on in their own gardens with peas and beans furnished by the family, and nitrogen-fixing bacteria supplied by the U. S. Dept. of Agriculture, at the solicitation of our farmer congressman. I think I never tried a more profitable short series of lessons in botany than a few I carried on last spring in having pupils experiment at home with fertilizers of various kinds. The majority of my pupils came from the crowded parts of Brooklyn; and the smaller number from farms or garden produce districts.

If the small high school draws from a grain-growing district, the life-relation idea can be exemplified by the conditions which help or hinder the germination and growth of the plants. The pupils know that various insects attack the plants at different stages of their career, but they may not remember in that connection that certain conditions and the number of certain enemies affect the abundance of the plant-destroying insects. The obvious problem that might develop in their minds would be, "What can we do to create the life-relations most favorable to our food-producing plants?" Then it is remarkable how interesting the supposedly dry Farmers' Bulletins become to a group, even of city boys.

A fruit-growing community has an even more varied set of factors to study. The many species and varieties are adjusted with varying success to the complicated environment of soil, weather conditions, and plant and animal neighbors and parasites. Then there is the very interesting field of plant propagation. I have found many boys with some skill in transplanting, growing under cold-frames, growing from cuttings, and even in grafting.

There are blights that come apparently from nowhere. If you want to show the biological meaning of a fungus in nature, and bring out the point that they are tearing down what has been built up by other organisms, take a fungus that has been making trouble in the community. If you want to develop interest in insects, if any is needed, take up an insect that has made itself felt against the food-producing industries of the neighborhood; it may be a grasshopper, a scale-insect, the cotton-boll weevil, or anything else. I have heard objections made against the study

of unusual or non-typical forms, and those of small size. You couldn't well urge the small size of bacteria as an objection against their study. Still they are quite small.

Now, where does the culture come in? I think that isn't a difficult question to answer. It has been proven over and over again that if practical things are studied in relation to all other things that affect them and are affected by them, the study gives one an insight into the actualities of life. It explains and interprets what before was seen in isolation, if at all. That understanding necessarily gives one a commanding position with reference to his environment. He knows more, he feels more, he is more. To my thinking the cloistered scholar whose mind has been fed on what other men have said and done, and nothing more, can not compare in dignity and worth of culture to the man who knows something of the best said and done by men, and also has some knowledge of the conditions which made man possible and the conditions that will favor his long and healthy existence upon the earth.

Another phase of culture not necessarily implied in the old idea conveyed by that term, is the ability to think. If I remember correctly in my first acquaintance with cultured persons, I was impressed with the fact that they knew a great deal (about the things which they considered worth while) but they did little general thinking. As I have tried to point out in dealing with the biology work in small high schools, ideas are very valuable possesions. I suppose it is possible to entertain an idea supplied by someone else without thinking much about it, but I doubt if it is possible to use one without a little motion in a train of thought. Certain it is, a person cannot develop an idea without doing some clear thinking. I believe all scientific men, and others who use scientific methods, would agree that the possession of the ability to examine facts, to interpret them, and to bring them into harmony with a constructive theory entitles one to be ranked as a cultured person.

The scientific method of thinking, in a simple form, may be employed in the study of biology in the high school, and even in the elementary school. The best vehicle for the method is undoubtedly the experiment. I do not mean the experiment that is printed in the laboratory manual which may be read at any time by the pupil, but probably not comprehended. Experiments in

biology will seem most like the experiments in life if the problems which give rise to them develop naturally out of previous experience. The teacher may know, and in fact must know, those phases of his subject which permit of easy experimentation. He may even direct the course of the work so that certain problems will come up. But if he brings them up himself, he can hardly expect pupils to have as much interest in them as if they had thought of the problems themselves.

In my experience I have found that the materials of botany offer more opportunity for easy dependable experimenting than zoölogical material does. There are many interesting activities of animals which are not difficult of observation or interpretation, but there are likely to be unexpected occurrences which make it difficult to carry the work along with decision, unless the class has received preliminary training in the more subdued experimenting on plants.

In approaching a new topic in botany, zoölogy or general physiology, I find it advantageous to establish a temporary clearing house of information. To this center the members of the class are invited to bring whatever they possess that relates to the topic. As one might imagine, much of the information is based on hearsay, and very little is known individually by experience. The pupils take part, under leadership, in the analysis of the information. Some is irrelevant. Some is evidently inconsistent with principles already established. Some is too difficult to study. The rest is within the range of our facilities to study further. Then one by one the problems to be worked on by simple observation or by experimentation are formulated by class discussion and criticism. The problems being formulated, materials are brought together, the class suggesting what is necessary to do in order to arrange satisfactory conditions for the experiment. When results are obtained, their interpretation is made and their bearing on the problem stated after class discussion. I think I speak safely when I say there are few topics in biology from bacteria to man which may not be touched by direct observational or experimental method in high school biology, to the great advantage of the pupil. He gets training in analysis, in accuracy of observation, and in expressing himself clearly.

Remembering the sad cases of biologists and other scientists who do no thinking except in the technicalities of their own specialties, some of us take steps to prevent as much as possible the

creation of more of their kind. We may not be able to develop skill where there is scant material to work on, but we can arouse interest in thinking, which may or may not develop into real tangible power. In order that the thinking of the laboratory may lead to being useful in after life, it must be related in its associations then and there to as many of the permanent interests of human life as possible. This we try to do on every occasion.

One's imagination runs far beyond the mere question of whether we shall call a thinking man cultured or not, to the much more stirring conception of a splendid civilization in which every man and every woman thinks through the maze of conflicting issues and sees the right and honest thing to do in the clear light of reason. I have so much faith in the method of science that I believe it can, if properly handled, contribute a great influence toward breaking down prejudice and meaningless tradition, and building up ideas of right.

Although clear thinking, if it is honest, must inevitably develop principles of morality, I believe those principles may be buttressed by still another phase of biology teaching. Outside the realm of authority, with which the experimental method has little in common, I take it that much of what men consider right for them to do has developed as a conclusion or as an interpretation from a complex of interrelated personal or social acts. We advise children to do right, because it is right. Perhaps they might come nearer understanding if they should experiment and learn of the existence of a few elementary principles of conduct based on the real or supposed welfare of society—principles worked out slowly through centuries of time.

If we regard all the acts of men which have resulted incidentally in the formation of a changing moral code as biological phenomena, we simply bring human biology into the category of general biology, where it belongs. In that field of immensely complex and never-ending activity, the dependence of one organism on others, with their conflicts, is inevitable. In all this there are untold adaptations or adjustments of each organism to the conditions of its environment. Forms exhibiting unusual and unencouraged variations in structure are in danger of paying the penalty by death, because the environment, too, may not change. Considerable variations may occur, however, and new and more highly organized forms may and do develop in a favoring

environment. The welfare of the group is promoted because the existence of several variations accepted in related environments tends to insure the perpetuation of the group. The group has carried on an unconscious experimentation without intelligence, and has found the conditions that promote its welfare. In other words, it has found what is good for it. Some of the things that were found to be good for it concerned the relations between the individuals of the group themselves. Among these individual principles might be mentioned the disadvantage of interference with each other's food supply, the result of growth in an unfavorable situation, as failure to attain normal size; also the disadvantage of being in a weakened condition, subjecting the individual and even the species to the attacks of disease.

The lesson for young people, certainly in the lower range of moral actions, may be learned by their understanding what happens to other organisms if they transgress the laws of their environment. If, as the result of man's intellect, we are able to avoid some of the risks that lower organisms encounter, there appear to be many that are peculiar to ourselves. Although these are distinctly higher than those which affect more directly the existence of man, I believe they are being worked out on similar lines. When our children's children come into the intellectual life they may apply the principle of adapting themselves to the changing environment by experimenting to find how they may adapt themselves most fully. The discovery that justice and fair play between men are necessary to complete adaptation, is not an impossibility.

I have tried to show that the study of biology undertaken with definite plan, and with ideas concerning the relation of the subject to human life, will help in the development of culture. Whether we call the ideal we have in mind culture or by some other name, is of no particular consequence. Let us hope, however, that biology and all our school subjects may be made to contribute to the establishment of a finer and richer civilization.

GENERAL DISCUSSION.

MISS EMMELINE MOORE, NEW JERSEY STATE NORMAL SCHOOL AT TRENTON.—An appropriate title for the doctrine expressed in these excellent papers on biological science, may well be this: "The New Rationalism."

The first paper is a strong plea for science as a method; because science as method precedes science as subject matter. The development of the scientific attitude of mind, the cultivation of the scientific habit of thinking, until it becomes instinctively a part of the pupil's mentality, is the goal toward which we are aiming. Quoting from Dr. Gager's paper, "To learn to observe accurately and without prejudice, to record one's observations faithfully, to limit one's inferences to what his observations justify: these are some of the cultural results of botany properly taught, and these alone would justify its place in the curriculum."

Much has been said and written on how to mature and make effective this scientific attitude. If it were more generally accomplished, the discussions before this association to-day and to-morrow, the practical versus the cultural, would be unnecessary.

In regard to the botany and zoology, there are several criticisms. One is that the practical subjects, the utilitarian aspects, are not properly welded into the course, or that the aim is to make investigators, botanists or biologists. When one considers that the teacher is the most important part of the course, these criticisms have some foundation in fact.

How many teachers of high school botany and zoology do you know, besides yourself, who are broad enough in training to interpret the local practical problems and amalgamate them into the course? A most hopeful outlook is that in the Association of Secondary Schools and Colleges of the North Central States, the minimum requirement for a teacher in the high school botany is recommended to be two years of botany in a college, augmented by studies in zoology, bacteriology and physiology; and, moreover, that a teacher should also have some knowledge of the purpose of the high school course in botany, and of current and desirable practice in teaching botany.

It seems to me that more hopeful than that outlook is this:

that the recent deluge of agricultural and industrial education is literally swamping the unfit who are teaching these subjects. This evolutionary process is going on rapidly. For teachers without adequate equipment are hesitating to teach courses in high school botany and zoology; moreover, high school principles refrain from asking a teacher to take a course in botany or zoology, simply because "there is no one else to take it." The criticism that the course is narrow, that the teacher fresh from the university or college course is teaching merely diluted botany and zoology which he learns from a narrow-minded specialist, is fast losing ground; because the time is going by when in the college or the university Professor Pinhead refuses to acknowledge Professor Pinpoint and both or neither will have anything to do with Professor Whole Pin.

In regard to the second paper on biological science I am somewhat in the position of the man who said he did not like to hear more than one side of an argument; because it kept his ideas from being upset. I didn't know what Mr. Linville was going to say; but I welcomed his paper—not only because it invites many points of attack, but because it gives you a general field of discussion. In regard to the general discussion which he took up, various relevant questions, observations and criticisms follow in practice. In the first place, where are we going in biologic science, and how are we getting there? It seems to be agreed that we are aiming at the goal, Power to do work. However, there is not the same unanimity of opinion on how to reach that goal. Some hold to regular botany and zoology; and this begins usually in the second, third, or fourth years of the high school. Others lay great stress on biologic science, a kind of hybrid course, with botany, hygiene and zoology appearing as dominant strains; others, as yet in the minority, favor an elementary course in science coming in the first year of the high school. This is a cross between the nature study of the grades and all the sciences that can be taught in the high school.

Considering the varied kinds of material that appear in these courses of biology and in elementary science, I believe that it requires a teacher heaven-born to give the correct sense of relative values, to give a correct notion of proportion, to properly interpret and properly simplify without sacrificing scientific accuracy. Here is the most important criticism I can make: to

simplify without sacrificing scientific accuracy. There is the greatest need and the greatest opportunity for high school teachers to investigate material of this kind, to the end that there may be greater simplification, without the sacrifice of scientific accuracy. I would believe in a course in biology if the mass of material were not so heavy, if the tendency were not to swallow courses in biology ready made, and if the tendency were not to take in nature at a glance—taking in nature at a glance nine times out of ten takes us in. I would like to see developed a course in biology in which there is less tendency to rely on the efficacy of information only; because there is a limit to the amount of information that one can take in: it produces knowledge static instead of knowledge dynamic.

I am sure that in the Middle States and Maryland there are a good many who are working out problems in biology in a strong way; and further discusion should bring out whatever there is of merit, for whatever has merit will stand discussion.

PROFESSOR WILLIAM S. FRANKLIN, LEHIGH UNIVERSITY.—I am so completely in accord with what Dr. Linville has said that I am puzzled to think that he does not agree with me. Either we differ in what we mean by culture or Dr. Linville thinks of physics as a sort of universal philosophy. To my mind, physics is one of the narrowest, most specific and practical business propositions in this world; and I think of culture also in a narrow, personal sense as lying almost wholly within the realm which includes poetry.

The greatest school of physics in the Lehigh Valley is the Bethlehem Steel Works. The study of their ten thousand students is largely irrational, but it is real; whereas most of my seven hundred students' study is rational, but some of it hopelessly unreal. Maybe the pleasant satisfaction derived by innumerable dilettantes from the reading of popular treatises on radio activity, and that sort of thing is good physics, but I doubt it; I doubt it very much indeed. I think mankind would be better off if nobody, absolutely nobody, *thought* physics but practical physicists, including the ten thousand and the seven hundred. If you have to do with material things you need physics, sometimes a little, sometimes a great deal, but you need it for that purpose only. I cannot imagine why any one should bother about physics if he is never to use it.

MR. FRANCIS N. MAXFIELD, GERMANTOWN FRIENDS' SCHOOL, PHILADELPHIA.—It seems to me that the subject of the conference this afternoon and in this morning's session, is particularly adapted for discussion; and I was surprised that a great many people did not jump to their feet at once, because it has this advantage—that in our present state of definition, as was shown to us this morning, it can *never* be decided, and *must* be an open question. That is, the distinction that should be made between cultural value and general discipline, in contrast with the practical, vocational aspect of subjects, is something which is open, for several reasons. First of all we need experimental data upon the subject, and I was glad for this reason that Galileo and Bessel were mentioned this morning: we needed the experimental study of the science of physics of Galileo's time in regard to the law of falling bodies, or of that of thought processes of the time of Bessel to give us a real basis for scientific theory and practice. We are going almost entirely on *a priori* reasoning, based on a false psychology, and largely on a comparison of subjects that have been taught to young people for years and years with a refined method and a narrowed content, with subjects that only recently found their way into our curriculums. And secondly, these discussions are hopelessly confused by the lack of definition which was mentioned this morning—lack of distinction of what we mean by cultural and disciplinary effects; and it seems to me that before we reach any definite conclusions along these lines, however interesting our discussions may be, and however instructive the papers which have been read to-day may be to those of us that are teaching the particular branches mentioned, we can arrive at nothing definite until we can record the results of our teaching and interpret them objectively and express them more definitely than is possible with such categorical terms as have been used to-day, "reasoning power," "the power of observation," and that sort of thing.

I think we are especially indebted to Professor Franklin, who was willing to speak of his subject as something which has no excuses to offer for itself—something which gives the instructor an opportunity to get a grip on a class of young men or boys and girls and teach them something; some medium for him to come in contact with younger life, and influence a group of young men, or of young women.

DR. C. STUART GAGER, BROOKLYN BOTANIC GARDEN.—Dr. Linville states that he does not agree with what I have said. But I really cannot see any essential difference between his position, as stated in his paper, and mine. I would do everything in teaching classes in botany that he outlined and have done it over and over again; but possibly we might both proceed similarly with slightly different points of view. For example I would by all means include such topics as the value of clover to the soil and the practical application of our knowledge of bacteria in every-day life; but the imparting of such information would not alone, in my opinion, justify the introduction of formal botany into the high school course of study.

And I would like to ask Professor Franklin, who says he can see no point in teaching physics to any one who is not going to "use" physics, how a boy is going to know he is to need physics (or would like to pursue a life-calling that requires a knowledge of physics) if he doesn't know there is such a subject as physics? If I may be pardoned a personal illusion, I pursued a thoroughly classical course until my second year in college, and at one time I thought I might teach Latin and Greek. But, by some fortunate turn, General Biology was introduced as a required study in my junior year, and I discovered then for the first time, that I had never been interested in anything before. I never had really been interested in anything before. When I saw how I took hold of that study, and how it took hold of me, I knew at once that I did not care for anything else that didn't have something to do with biology. Eventually it narrowed itself down to botany. It was in being required to study a subject which nobody knew whether I was to use or not that I discovered my major interest in life, and found out what I wanted to make my life work. It is part of the purpose of education to give breadth of outlook; not merely to prepare for a vocation decided upon beforehand.

PROFESSOR JOHN M. MECKLIN, OF LAFAYETTE COLLEGE.—Professor Franklin has put his case so clearly and his challenge is so strong that I cannot resist saying a word on the other side. He began by referring to a view of a liberal education as championed by his colleague, Professor Hughes, and seemed to imply that "liberal" in education means a license for every

sort of loose and unscientific thinking. Taking a view antithetical to this interpretation of "liberal," he suggests that education means first and always *discipline,* and insists that disciplinary training can be gotten nowhere so well as in the scientific laboratory in the attempts to solve scientific problems. Now I do not think that the two points of view are necessarily opposed to each other. For who is the "liberally" educated man in Professor Hughes' meaning of the term? Is it not one who has been taught, first and foremost, to think clearly and accurately; that is, one who has disciplined mental powers though that discipline may have been gained outside a laboratory? That being true, Professor Franklin's contention is right to this extent, that scientific training and scientific accuracy are essential in that they give us trained men or men with disciplined powers for whom society will always have need. But a true ideal of education must include a good deal more than the mere possession of disciplined powers. A machine has disciplined powers in a certain sense. It is produced to perform a certain work and the extent to which it does so is the measure of its efficiency. A strict interpretation of Professor Franklin's conception would make men mere machines and our educational institutions factories for turning out highly specialized human machines. Among the elements that must enter into our conception of the educated man *efficiency* is one to be sure, but not the only one nor the supreme one. The ultimate test is *manhood;* the human interest must and will always take precedence over the economic.

Now Professor Franklin has laid down another challenge. He says that he cannot see any possible reason for the study of physics except as the knowledge gained thereby looks to some immediate, practical *use.* The whole question turns upon the meaning we attach to the word "use." Taking education in the broad sense of an equipment that enables a man to fill a place in society, we may say that every subject in a certain way has its "use." In fact, we may go further and say that the test of subjects taught in the curriculum must be largely their usefulness. But I take it that by "use" Professor Franklin means the narrow, utilitarian conception of the word. Training in physics is useful when it brings practical results in a financial, industrial or economic way. It would be interesting to call the roll of all the great physicists from Newton and Young to Helm-

holtz and Kelvin and see whether they would accept this measure of scientific and educational values. Certainly our modern life would be vastly poorer not only in the purely economic and industrial spheres but also in literature, religion, philosophy and even in art without their "useless" scientific investigations.

THE PRESIDENT.—I should like to say a few words, and ask the stenographer not to take them down.

I was invited in 1881, I think, to become a member of the New Jersey State Sanitary Association. The gentleman who extended the invitation said to me, "This is the most educational gathering in New Jersey." I accepted the invitation and found that what he said was true. The matters of biology that came up there for discussion in connection with the theories of the dissemination of disease germs, bacteria, etc., were very much more important that those that came up in our gatherings of teachers, and this query came to me: Why should not we in the schools take up these topics? Was there any reason why we should leave them out simply because of their immensely practical value?

The late Prof. Austin C. Apgar gave an amusing incident of a very learned discussion in 1870 whether or not object lessons should be taught in the school room. It was decided they should be, and those concerned promptly sent to England for a trunk full of objects.

Recently we in New Jersey, through the ravages of the San Jose scale have lost more than enough peaches to pay for our school system. One science teacher was engaged in a study of this insect and entertained by its spread in the neighborhood until, without his realization, it ruined many of our trees.

The old definition of education was the development of the powers of the mind through processes that were refining and informational. There is no exact declaration as to just which object of study will best accomplish these purposes. It is difficult to see why, for instance in botany, we might not select the object which most intimately concerns the neighborhood and its interests.

I said to a professor of mathematics, "Is there any of algebra that is absolutely necessary to the higher mathematics?" His reply was, "Yes, but you would be surprised at how little." It occurred to me then that it would be of great service to all who have the planning of courses of study if we could have a state-

ment made of just what was absolutely essential and must be required and what was of general cultural value and might be elective. Those who are principals of schools or presidents of colleges will fully appreciate the statement that each department feels it should have more time and such an arrangement of subject matter would greatly facilitate the pacifying of these departments, and would largely solve the conflict between the secondary school and the college.

THIRD SESSION

Friday, November 25, at 8 P. M.

PRESIDENT'S ADDRESS.

EDUCATIONAL ECONOMICS.

PRINCIPAL JAMES M. GREEN, NEW JERSEY STATE NORMAL SCHOOL AT TRENTON.

It has often been said that we of the United States of America have no national system of education.

It is true that we have no system of education emanating from Congress, but we nevertheless have a nation that is being educated. We have entered upon this education with characteristic zeal. We are contributing more per capita in public and private funds than any other country.

The problems of our education are more complex than those of any other nation. We are very young. The settlements out of which we were formed have not reached their third century. Our Articles of Confederation, our first national compact, were drafted but one hundred and thirty-two years ago. Our Constitution is but one hundred and twenty-one years old.

A nation is the sum of its people. Our people have been a rapid accumulation. We began in 1789 with less than four millions. We gained one million in the first decade; in 1850 we had reached in round numbers twenty-three millions; in 1900 seventy-six, and in 1910 ninety millions.

For the last few years immigrants have been coming to us at the rate of a million a year. One-seventh of our present population was born in foreign lands, over one-fifth are the children of foreign-born parents. This gathering of people has not been homogeneous, it has represented every land, every clime and every race. While Austria-Hungary, Italy, Russia, England, Ireland and Germany have contributed most largely, Phoenicia of early art, Greece of ancient philosophy, the Orient of unbroken caste, the "Dark Continent" and the islands of the seas have added their portion.

"The very names recorded here are strange,
Of foreign accent, and of different climes;
Alvares and Rivera interchange
With Abraham and Jacob of old times."

Among the vast numbers who have come to us few have left their homes with any intention of becoming Americans, and still fewer have had any adequate conception of what it meant to become an American. Most have set out in quest of fortune, or to right some wrong, or to escape some oppression, real or fancied. The conditions under which these people have lived have often been a heritage re-enforced by the habits and customs of centuries.

We who have learned to appreciate the purposes of the Mayflower company through their results have unconsciously assumed too much. The adoption of a reform principle does not at once change even the whole man, much less a company. A complete change of character requires long periods of time. A sea voyage, no matter by what purposes prompted, did not greatly change ideals.

Ruler and subject, patrician and pleb, were designations common to the old world. We might have expected only representative and citizen, employer and employee in this country; instead, we early find master and slave, bound and free.

Religious oppression brought us our earliest settlers. Surely religious tolerance was to be anticipated in our government and it *was* incorporated in all our fundamental documents, but dogmatism appeared in our earliest writings and teachings, and religious bias has directed many of our political favors. The church was the expression of the religions of the old world, and for centuries was practically the repository of education. Learning was considered the concern of the individual directed by the church as the spiritual adviser. Many of the problems of state grew out of this notion.

One of the major problems of England even to-day is to separate her education from the dominance of her church. A distinguished Englishman said of his country that "For the last century the history of its progress educational has been the history of its tragedies. When the two contending forces were exhausted and lay on the ground panting for breath progress would slip a little way between the lines."

How potent have been the influences of private education and the church transplanted to this country will appear in the fact that of 606 institutions of higher education reported in 1907, 89 are state or municipal, 517 are privately controlled, 394 are sectarian, and but 212 non-sectarian. When there are added the

many academies that are sectarian and the great number of parochial schools, one is constrained to say the ocean as a dividing line is geographical rather than institutional. Furthermore, distinct as have the private school with class tendencies and the church school stood out, there have been tendencies of the curriculum more subtle, yet not less far reaching. Sophistry, Scholasticism, Humanitarianism, Idealism, Realism, and the other philosophies, have each had their place, reduced in emphasis only by the crude conditions of the country. How effective may be some one ideal is illustrated when the superintendent of a city of two million inhabitants can tell at a given hour what is being recited in every class, and when a state of five or more millions of inhabitants is bending its energies to guess out and prepare to answer examination questions selected by persons not necessarily a part of the teaching force.

The influence of the old world on the new appears in the rough when the legislature of a great state is obliged to pass a law that the English language shall be taught in every school at least a given amount of time each day, and when the Germans of a great city insist that their language at least shall be a part of the school curriculum.

We shall be further impressed with the force of our heritage in ideals if we turn an attentive ear to the discussions on the classics versus the sciences, the cultural versus the pragmatical, and so on.

The complexity of our problem has not been due entirely to influences from the old world. Incidents of our own history have entered into it. Jealousy of "State Rights," territorial government, land grants, municipal and rural conditions, race problems, and "Local Initiative" have all contributed their share.

The above statements may not lay claim to exactness or thoroughness, but they will have accomplished their purpose if they emphasize in some small degree the thought that the most pressing demand upon the educators of our country is to work out a more clearly and economically directed education for our people. The undertaking is a tempting one from the very fact of our newness, our isolation from the older countries with their involved social relations and institutions, our opportunity to apply the "Monroe Doctrine" to things intellectual as well as territorial. If we are to perform this task successfully we must lay aside so far as possible all preconceived notions and anoint ourselves with the true scientific spirit of inquiry before conclusion.

The elements of an educational system reduced to its simplest terms are its universality, its scope and its organization: Who shall be educated, what shall constitute the scope and what the means? The substitution of the three W's for the three R's. Let us take these W's in the above order. Who shall be educated? Every one of suitable age. This answer may seem trite, and yet it is safe to review its significance.

The characteristic of the older countries was ruling classes or "houses" who were to take the chief responsibility of government. The characteristic of this country is that every man belongs to the ruling class and must be instructed for his part. This is no new proposition but it needs new emphasis. There are yet parts of our country where we hear much of the education of the classes and the masses. One of our leading statesmen recently remarked that a good secondary education should be provided for the residential towns of his state, but the city in which he lived was a manufacturing city, that the majority of its inhabitants worked in the mills, hence they did not need the more liberal advantages. His views had great weight. That same statesman, in an impassioned oration concerning our "new possessions," said: "The Constitution must follow the flag." It is difficult to imagine the consequences of the Constitution without first the school book in the hands of the Moros.

There is no one who can anticipate the destinies of any community, or any class of people sufficiently to say what their education should be. It is the function of education to furnish oportunity. Individual or community destiny through the aid of opportunity is shaped by larger forces.

The limitation, suitable age, is important. One who listens to the many discourses on popular education is impressed with the confusion of the function of the school on one end of the curriculum and the library on the other. It is not uncommon to hear the advocates of the three- and four-year old kindergarten claim that the children of the crowded districts are better off in school under a trained teacher than playing in the streets. This claim is wide of the point. The real question is, at what age is it suitable to pass from the individual care of the home to the organized care of the school. The care of the young child in the crowded district is incidental and pertains to the day nursery and not to the school.

Likewise very much that is recommended as supplementary reading pertains to general intelligence and lies within the field of the library rather than the disciplined and required work of the class room.

Our second W, the school curriculum, is perhaps of more concern; certainly it has been and is the subject of more criticism. Here more than elsewhere have been manifested tradition, imitation and lack of adaptation. It is within my own easy recollection that Logic, Astronomy, Butler's Analogy and Metaphysics were found in the curriculum of the academy.

Our educational literature has been redundant with Herbartianism, co-ordination, concentration, and implied coagulation. The beginning of foreign language has ranged from the nurse to the high school. Specialization has ranged from the kindergarten to the university. Laws have been enacted requiring the teaching of certain phases of morals according to scale. Not what should a boy know, but what will admit to college has been a dominant question, and fads and fancies have run riot. The complexities of the organization of the educational system of one of our large cities would carry one far afield from the simple old-time proposition that a pupil was one who needed to learn something, and a teacher was one who could teach that something. The present statement would be—a pupil is one who needs to know, and the teacher is one who under the direction of the supervisors in the various branches, teaches subject to the approval of the principals and district superintendents, subject further to the approval of the general superintendent and the board of education, the knowledge prescribed in the manual.

What is a boy to do, and therefore what is he to know? is a direct question, and one that should admit of a fairly direct answer. The boy is a social being. He is to live in a community and must be able to communicate with those around him, and in an accurate and reliable way, hence he must have a vocabulary that will cover the things at least that are common. He must be able to speak and read and write to this extent at any rate. He must co-operate with his fellows in production and exchange, and must have a means of measuring, comparing and determining values. What is termed arithmetic must be taught at least thus far. He is constantly called upon to pass judgment on material things—the house in which he lives, its furniture, the conveyance in which he rides, the pavement on which he walks.

He should therefore be taught manual training, at least to this degree. As a social being he must know his place in the community, his rights, how to secure them, and what they signify, and must study history at least to this amount.

Do not think I am mistaking my audience, or that I would insult its intelligence by undertaking to present to it a fully written-out course of study. My only desire is to illustrate and enforce the idea that there may be a course of study that directly contemplates the specific problems the boy must meet and prepares for them. I am keenly mindful of the dissipating influences that present themselves at this point, the lofty categories that offer themselves as studies, but when it comes to the measuring of real values, to determining a rule of life, there can be no course so safe as to study life itself. This is our only representative expression of its Author. Whatever studies may be used as means to ends, the final end should be to open the book of real life.

Our third and last W, our school organization, is one of the most immediate concern.

Our country from the organization point of view, broadly speaking, may be divided into the west and the east. The west by reason especially of the great land grants has been able to include higher education in its free public system. This gives opportunity for a unity and general completeness under the care of the state. This system has accomplished many and remarkable things. In one state higher education has been carried to the point of establishing not simply one clinic in the college of medicine, but clinics for each separate school of medicine. Agriculture, horticulture, dentistry, ornithology, and so on, are all included in the curriculum.

The president of one of our oldest eastern universities stated the other day that he regarded the University of Wisconsin as practically the only really complete university in our country. Think of fifteen hundred farmers gathering at a university for short winter courses in agriculture. The university has become the center of learning not only for those regularly in the technical classes, but for popular courses as well.

The university in these western states is an organic part of the state system. It is at the top. Its tap roots are recognized as running down into the system and drawing their nutriment from it, hence the presidents and professors of the universities go freely into the secondary schools, and even farther down, and advise, instruct and encourage. The results of this system are yet too

little tried to admit of very firm conclusions, but those who are under the system are very enthusiastic as to its outcome, believing that it promises results for the advancement of education that cannot be secured outside of a higher education supported by the state.

Our east practically limits the scope of its education under the state to the secondary school. The only exceptions to this are in favor of a few technical industrial schools. The east may be said to educate its pupils under the state through the secondary school, and then turn them over to private or special institutions for their further study at their own expense or at the expense of the endowment fund of these institutions.

This arrangement involves serious perplexities. The independent endowed private institution may be conducted on a business basis, or an educational basis, or on the basis of some peculiarity in its foundation. The man who endows a college or seminary may be said to have a right to dictate what shall be the curriculum in that college or seminary. Whatever may be the conditions, public or private, it is certain that there is not complete harmony or cordial sympathy between the public educational system of the past and the college, such as exists in the west.

The dean of one of our large universities in the east said the other day that not twenty per cent. of their students came from the public high school.

The State of New Jersey is spending about seventeen millions of dollars annually for its public schools. It has one hundred and eleven four-year course public high schools on the approved list, and about eight hundred teachers engaged in these schools. Some of these high schools have an enrollment of from fifteen hundred to two thousand pupils. It would seem that such an elaborate system should send from its high schools enough students annually to fill several colleges, certainly enough to fill one large college or university, and yet the actual number going from the high schools to the colleges is relatively small. This fact is not due to a lack of means on the part of those whose children attend the public high school. In many of our towns, especially the residential towns, most of those who send their children through the high schools are fairly well to do.

There has been very much claim that the work of the college was not suited to the needs of the majority of the graduates of the high schools, that these graduates were in the main intending to

pursue mechanical or industrial occupations that called for a more technical and practical higher education than they could generally get from the private colleges.

If one were at all in doubt as to the lack of harmony between the college and the public high school, he would only need to attend the various meetings of this Association and listen to the numerous annual discourses on the college entrance conditions, certification, uniform entrance examinations, and so on, to have that doubt removed.

That which is heard in this Association is but a small part of what is heard in the various high school gatherings.

May we not agree on certain general propositions?

1. That the uplift of the whole people is the greatest object of education.

2. That the colleges and universities of the east, whether privately or publicly supported, are assuming the greatest responsibility for this educational uplift.

3. That if this uplift is to be accomplished in the most effective manner, the college must be the most earnest and sympathetic student of the lower forms of education.

4. That as in the west the tap roots of the university run down into the public high school, so in the east the tap roots of the private college must at least in part run down into the public high school, and that this fact should establish a sympathy that would cause the college to say, What can I do to help you? and the high school to say, What can we do to improve ourselves? a condition of sympathy that would attach more importance to the uplift of an educational system as a whole than to the danger of misplaced confidence in some form of transmission from secondary to higher schools.

Our educational institutions, especially those of the higher learning, have done a great and noble work in the past. They have borne the torch light of the advancement of civilization, and yet the great work that has been done seems small in view of the work that is yet to be done. The demands of the twentieth century seem coming upon us like a mighty flood. The problems that are to be solved, the enterprises that are to be undertaken, the concourse of nations that is to present itself, all conspire to impress the true educator that there is greater need for warm sympathetic and co-operative service than ever before, a need which may even cause the state and the private institution to clasp hands.

FOURTH SESSION

Saturday, November 26, 10 A. M.

THE PRESIDENT.—I shall make a very slight departure from the program that will not delay us any length of time.

Those of us who are at all familiar with organizations and movements, know that there is someone who is always the central figure and the mainstay in an organization, and becomes identical with its history. We have lost such a one this year in the death of Dr. Kieffer; and I have asked President Thomas Fell, of St. John's College, to act as chairman; Miss Alice Hill Byrne, of Miss Hills' School, Philadelphia, and Professor John H. Stahr, of Franklin and Marshall College, to act as a committee in preparing a suitable resolution; and President Fell will report from that committee at this time.

PRESIDENT FELL: Mr. Chairman, Ladies and Gentlemen of the Association: In rising to fulfil the duty that has fallen to my lot, I desire, in the first place, to say a few words on my own account. As you all know, this association was founded originally at Franklin and Marshall College; and that at that time, I believe, Professor John B. Kieffer became connected with it, It was not until one or two years later that he was elected to the office of Treasurer, and, so far as my memory goes, it was at the meeting in Philadelphia, when the association was widened so as to receive into its membership representatives of the colleges and universities of the Middle States and Maryland. I was one of those who attended that first meeting; and so I claim the privilege of knowing and being associated with Professor John B. Kieffer from almost the earliest inception of this association.

As we all know, he was a man of modest and retiring disposition; yet he was always active and vigorous in the discharge of the duties entrusted to him. He was generous, warm-hearted and full of love, both to his friends and to those who were associated with him. I may flatter myself that I may number myself among those whom he called friends; and so it is with particular sincerity of heart that I now present to you these resolutions

which have been drawn up by the committee, and refer them to your consideration.

WHEREAS, Professor John B. Kieffer, our highly esteemed Treasurer, has been called to his eternal rest, be it

Resolved, That we express our deepest regret at the ending of a life devoted to the promotion of the highest form of education, and our sincere sorrow for the passing of a well loved friend, who labored so faithfully and with such unremitting interest for this Asosciation.

Dr. Kieffer belonged to the older school of learning, where deep and broad general culture was essential, and in pursuance of his avocation he loved to develop not merely his own resources, but to lead others on to higher planes of intellectual thought.

Thus he was something more than a mere specialist in the classics, something more than a vast storehouse of knowledge, and we may well believe that his influence will live after him, inspiring those who have been in personal contact with him to "build more stately mansions" wherein their own souls may attain to a higher development.

As a friend his nature was so kindly and generous that those who knew him were impressed by his consideration and courtesy.

As an officer of this Association the same traits of character were manifest, while his calm, dignified demeanor in the discharge of his duties was indicative of the nobility and elevation of his mind.

And so, we say farewell to one who has lived well his life, and who, having served his generation, leaves a loving remembrance in all our hearts.

THOMAS FELL,
JOHN S. STAHR,
ALICE HILL BYRNE,
Committee.

THE PRESIDENT: You have heard the reading of this minute. May we not rise for just a moment in expression of our approval.

A PRACTICAL WAY OF TEACHING LITERATURE.

PROFESSOR JOHN ERSKINE, COLUMBIA UNIVERSITY.

To some teachers of English the tendency to divorce literature from the work in composition is a misfortune. We see this drift unmistakably in the demand for separate questions on the entrance papers, one set of questions to test the student's acquaintance with books, the other to sample his writing; as though knowledge of books were conveyed by a different mental process, or a different grammatical relation of noun and verb, that knowledge of baseball. Let us grant that the boy at a certain age writes more spontaneously about his games than about his books. We may still question whether the athletic subjects lead to as much thinking as the literary, or in other ways serve so directly the boy's education. If the experience of books were as natural and intimate as the experience of a baseball game, doubtless the student could write of books as intimately and as naturally. Shall we hold that the experience of baseball has a higher cultural value than any literary experience? Or shall we think that the duty of the English teacher, from the earliest school grade to the highest college class, is to make of books an experience as intimate and natural as any that can be found on the athletic field? If we take the second ground, and succeed in our teaching, we shall no longer ask for unliterary topics to show what our students can write.

The demand for the unliterary topic comes from the teachers, not of books, but of composition. It is easy to sympathize with them. They have held up certain classics or certain selections—from Macaulay, Ruskin, Newman, perhaps—as models for their pupils; and their pupils continue to write quite otherwise. When the average schoolboy writes about books, they find that he says something reluctant, conventional, dishonest and vague. Rather than promote an immortal soul further into this perdition, they cry for topics on which boys and girls can write spontaneously and sincerely, as out of their own lives. But it is fairly debatable whether any such topic can be found in their lives, unless they have learned to think and reflect. The natural boy has no more ideas about a baseball game, or the natural girl about a glass of soda-water, than either has about "Paradise Lost." When they

say they like the game or the drink, they have said all. True, they can be taught, by meditation upon these pleasures, to squeeze out a few further things to say, but is the expedient worth while? If we can teach them to think at all, why not teach them to think of great matters? The complaint of the teachers of composition must be answered, not by running away from the problem, but by studying it in the teaching of literature, where the seeds of bad writing are planted.

The method for teaching literature which I would suggest, involves the principle—first, that writing of any kind, and books, should be taught together; and second, that the writing should be related to the books. These premises are not widely held in our profession. A year ago I heard the chief of a high school department say publicly, with much applause, that he chose his English teachers not for their literary accomplishments, nor even for their college degrees, but for their understanding of children and of nature; specifically, as I recall his words, he wanted his teachers to know which end of a cow gets up first. The understanding of children we all agree to. For the other qualification, I confess I am unacquainted with any English writer who can be taught by knowledge of the habits of a cow. If my ignorance in this point affects the conclusions of my paper, let me admit it at once. To understand nature! What has nature meant to man but terrors and evil force, until philosophers and poets, brooding upon the world, taught us to see! The actions of that cow are meaningless until the poet or the artist, reflecting upon it, transmutes the fact into an idea. Should my friend the cow-champion protest that the teacher who knows the animal's habit may, poet-like, give his class an idea, I should cherish the hope; but I should also notice with pleasure the addition to his other requirements of a third and most important—that the teacher of English must be a philosopher or a poet. But it is not enough, from my point of view, that the writing should be related to books. Just *how* should it be related? Hitherto the teacher of writing has done the relating, and he is unwilling to do it longer. The teacher of literature must now come to the rescue, if the study of literature and of writing are not to be divorced. Hitherto we have tried to make books an open sesame to writing. Now why not make writing the doorway to books? We have attempted to put books into the child. Why not help the child to put himself into the books?

The aim of education, as I understand it, is to accelerate artificially the natural ways of acquiring knowledge. If we were all more interested in education and less in administration, we might have observed in what manner people, if left to themselves, develop a love of books. Having observed the principle, we might have renforced and accelerated its effect. Those of us who have read diligently in the lives of men of letters, have noticed two principles of the approach to books. The first is that whenever a man has discovered the charm of literature, he has discovered in books, not the author, but himself. In a natural contact with literature, the largest element is the spiritual recognition of one's own. Therefore the Yankee who said that Plato had got hold of some of his ideas, illustrated the approach of the human spirit to all art. The second principle, closely kin to the first, is that writers are always wise readers of their kind of writing. They may lack the critical faculty in general, but in their special field, like the shoemaker before the painting, they have eyes for their craft. Why not reconstruct our teaching to cultivate in the pupil some faculty that will recognize itself in books? If we can so arrange his mental processes that, without direction from us, he will see in the book a record of his experience, we shall succeed in teaching literature; and incidentally, we shall hear from the composition teachers no more protests against the literary topic.

In general my suggestion for teaching literature is to work on the boy, not on the book. The book you cannot change; the boy you can. The hope of most good teachers whom I know is to "make literature interesting." That has already been done, as far as it can be done, by the authors. What we can do, however, is to make the student interested. How many of us are guilty of those school editions which illuminate everything except the reader! How few of us have not tried to make books interesting by throwing around them a sugar-coat of some kind—by talking about the author, or about our trip through the author's country or the scenes of his imaginings—as a result, entertaining our pupils, but leaving them securely untouched by the book itself. When a student, so trained, is required to say something about literature, he usually simulates his teacher's enthusiasm, which he does not feel, and says what he thinks he ought to say, something second-hand, something vague, incorrect and insincere.

My specific suggestion is that before they read any book, the

students should write something like it; they should be in a position to perceive in books, not good examples foreordained for them, but later developments of their own writing. Of course this prophetic imitation must confine itself to externals, to technical matters, since our students have no ideas to match against the classics. It is evident too that certain books on our lists for reading or studying, such as the essays of Bacon or Emerson—cannot be imitated by young people, in either technic or substance, but if a book contains nothing, in either idea or treatment, that a young writer can imitate, it probably contains nothing that is in his experience, and it should not be on the list at all. The list is sufficiently varied, however, for our purposes.

For example, I should be well satisfied with "The Deserted Village" and Chaucer's "Prologue." Before the class had read anything of these poems, I should have them write a brief account of their own childhood, stressing the portraits of the people they liked. I should read their essays to them, especially those that had humor, and I should have all the essays rewritten, to bring out more humor. I should next have each student turn part of his essay into heroic couplets, no matter how crude his verse might be. Then for the first time I should speak of Goldsmith and Chaucer. If I know anything at all about human nature, that class would be interested to see how Goldsmith and Chaucer did it; and they would feel for themselves that the two poets were doing different things, in different moods.

You may think the writing of verse useless or foolish. But no answers on the entrance papers disclose denser ignorance than those dealing with scansion. How shall we interest students in poetry, if the formal dress of verse is to them inexplicable? In England the boys learn the mechanics of prosody in their Greek and Latin exercises. In America no boy writes Latin or Greek lines, and few write any English ones. Yet most children are natural versifiers, and may with a little practice become skilful. If they are reading "Evangeline," why tell them definitions of the hexameter? Why not read to them a little Virgil, for their imitation? The ignorance of blank verse among candidates for college is unpardonable. Any boy who had himself written twenty lines of blank verse, no matter how wooden, would know more of the versification of "Macbeth," down to its last peculiarity, than a boy who had heard a hundred lectures upon it. The same principle holds with older students. You can talk

till you are tired to college men on the skill with which Pope sharpened and pointed his couplets; if they remember a single remark of yours, they will not understand it. But let them compose half a dozen couplets every other day for a fortnight, and they will astonish you, not by the beauty of their verse, but by their appreciation of Pope's.

The essays of Charles Lamb are easily approached through writing. Give the class a summary of such an essay as that on Roast Pig, changing the animal, perhaps, and other details, so that the boys may be less quick to recognize it. Tell them to write up the essay in the funniest vein possible. Select the paper that most suggests Lamb's manner, read it to the class, and let them all fit their papers to that mood. Then read them Lamb's version, and notice how genuine and discriminating is their delight in the finer art. The method can be applied somewhat differently to "The Pilgrim's Progress" and "The Faerie Queene." Set the boys to writing short allegories, on any themes they choose. Encourage them to criticize each other severly if the allegory slips, if the two strands are not firmly woven. Make the writing and criticizing of allegory a kind of game. Then let them play the game with Bunyan and Spenser; you will be amazed at their insight.

Probably the most taught book on our list, and in my opinion the most pernicious in its effect, is the Burke speech on Reconciliation. The majority of teachers gloat over it, as one chance in a life-time to teach "structure," and the students come up with the most dogmatic statements as to the logical splendors of this speech,—statements which they do not understand, and which they would never make if left to themselves. It was hard to follow Burke's oratory when he spoke in the flesh; it is work for a mature mind to follow his argument closely on the page. I am always staggered by the glib enthusiasm of the well-disciplined college candidate over Burke's "structure." I always wonder why the student never mentions the surface traits of Burke, which ought to give a reader his first impression. Recall, for example, the stately cadence, the stately humor, of Burke's phrase. Whenever I have had to ask questions, against my will, on this abused masterpiece, I have asked what Burke proposed to do with the colonies. As this question touches that matter of structure, I have usually found the answers intelligent, but they never in the least suggest that the student has read Burke. One

candidate, I recollect, wrote simply three words, "Let them alone." You remember that the treatment Burke proposed for the colonies was "a wise and salutary neglect." If I were teaching a boy to find himself in Burke, I should first set him to phrase-making, and when he had learned the difficulty of that manufacture, he would not altogether miss the felicities that distinguish every page Burke wrote.

Perhaps I have made sufficiently clear my point of view toward books and writing, and the specific method I would suggest for teaching literature. The method is not a matter of theory. In a composition course some time ago I gave my boys an old exercise—writing without adjectives or adverbs—in order to make their nouns and verbs more specific. After a week or so I asked them to use only such epithets as they felt absolutely necessary, and I made them defend every epithet they used. To my surprise, they began to quote the usage of standard prose masters, and in a very short time they acquired decided opinions, backed by facts, about the diction of Thackeray, Dickens, Macaulay—writers for whom the undergraduate has usually only the vaguest criticism. I have since tried this method of teaching literature in other classes, and have come to look on a composition course as an opportunity to teach the understanding of books.

I cannot close without admitting the difficulties of my proposed method. We none of us have time enough! The entrance requirements are too exacting! We cannot command the student's leisure out of class! All these objections, and many others, are fair. Yet the principle is worth trying, within our limitations. A more serious difficulty my own experimenting has taught me; to apply the method, the teacher must take the craftsman's point of view, he must approach each book remembering that literature is nothing less than the immortal record of mortal life, and he must assume—and let the students know he assumes—that every boy in the class is for the moment an artist, striving to express his soul. This obligation upon the teacher is sometimes exhausting. But the reward is that you can interest the students in literature without yourself making a single dogmatic remark; you can make honest critics out of them, without stating a single predilection of your own; and through you they will find it as natural to have an opinion upon the mental habit of a great poet as upon the anatomical behavior of a Jersey cow.

THE LESSON-ASSIGNMENT IN ENGLISH.

MR. ELMER JAMES BAILEY, CORNELL UNIVERSITY.

Two eminent scientists—Faraday and Huxley, I believe—were standing at the demonstration table of a laboratory. Said one of them as he began to arrange a few pieces of apparatus, "Watch this experiment carefully and see what happens." "Wait a minute," replied the other, "tell me what to look for." This anecdote, it seems to me, has for teachers of English no unimportant lesson. If a scholar expert in physics or chemistry felt not ashamed to say, "Tell me what to look for," surely no instructor in a college or a preparatory school could greatly err in telling his pupils definitely each day just what they are to prepare, just what they are to find out, just what they are to look for.

At first thought everyone is likely to say, "Surely, that is no new advice; any good teacher will do all of those things." In theory, no doubt, he will; nevertheless, if I clearly remember my own experience as a pupil in a secondary school, in a college, and in two universities; if I rightly recall my observations as an inspector of teaching and as a chance visitor in classes of various kinds and grades, if, indeed, I am strictly honest in my own confessions as a teacher in preparatory schools and in educational establishments of higher rank, I am forced to conclude that in the matter of the lesson-assignment, the teacher of English has not a little to learn from the teacher of mathematics, of natural science, and of foreign languages. Where they are definite, he is too often vague; where they give exact directions, he too frequently says, "Write a theme for to-morrow's lesson; where they demand the working of ten examples, or the performance of five experiments, or the careful preparation of one hundred lines of some foreign text, he hastily calls to his class in the bustle and confusion of dismissal, "Take the next eight chapters," or "Read the rest of the poem."

Again, the recitations in the class-rooms of other departments are likely to offer a rebuke to a thoughtful teacher of English. Our colleagues demand and get more definite results than do we. They force their students to make the mind react upon the mere observation of words; they exact expression after every impression; they hear real recitations from the pupils before them.

Finally—and this is of great importance—they have fulfilled at the close of each hour's instruction the purpose with which they set out. How often do we, on the contrary, begin the recitation, perhaps get it somewhat under way, only to find that the period is at an end? The warning bell strikes, the students stir uneasily in their seats; we have no time to make an adequate summary or conclusion; and we hastily dismiss the class with the injunction, "Go right on with the work, we shall take up the discussion here next time." Thereupon our pupils hasten out of the room, carrying away one very definite impression—there's no lesson to get for to-morrow.

Already, beyond a doubt, I have offended. Such an attack as I have made upon my fellow teachers, coming from within rather than from without, is little less than treacherous. It is, seemingly, a shameless lending of support to the charge, more and more frequently made, that the study of English, whether as having a practical or a disciplinary end, is inferior in value to the study of mathematics, or natural science, or foreign language. Nay, more, perhaps you will say, it is an unprotesting admission that there is substantial basis for a pupil's regarding his classes in English as a source of amusement rather than an incentive to work. Will you, nevertheless bear with me for a little time while I offer some explanation of present conditions in the way of both excuse and defence, while I point out some of the ways in which we most do err, and while I suggest some means for making our work more concrete, more definite?

In the first place, then, I hasten to say that we have no uncertain rock of defense. English is not an exact science like algebra or geometry; it is but sparingly helped by the methods of the physical or chemical laboratory; it cannot be taught in the same manner as is Latin or Greek, French or German; it has far less in common with history than an unthinking person supposes. The complexity of the demand made upon us is far greater than that made upon our colleagues in other departments. The teacher of English can have no rest until his pupils are thoroughly acquainted with the structure of the language, until they are somewhat familiar with the history of the literature, until they have begun to show true appreciation of a considerable number of masterpieces, until they have acquired the power to do that most difficult of all things—to write, to speak, to give to intangible thought and feeling the tangible body of words.

Because all of these things are demanded, there can be little wonder that the teacher of English is often at sea; that at times he becomes distraught, that now and again he grows distrustful of himself. Nevertheless, let him pluck up courage. Apart from the mere data which other subjects supply, English, because it strives to do in an aggregate what they severally expect to do only in part, is superior to each of them, perhaps to all of them, both as a method of discipline and as a means of culture. Our diagrams and analyses and parsings are just as valuable in the training of young minds as is the working of examples in arithmetic and algebra; the theme-writing which we exact is far more practical than exercises in Latin prose, or the re-translation back into German of a translation of *Immensee;* the study of a book for its plot, for its interplay of cause and result easily vies, so far as it fosters habits of attention or strengthens the memory, or leads to logical conclusions, with a course of lectures upon the French Revolution; the accuracy demanded in determining the derivation of words or postulating the form which a Gothic word would take in Greek or Anglo-Saxon, is not less than that necessary for successful work in the laboratory, nor, indeed, is it of an essentially different kind. Surely, then, we have sufficient defence against the charge that we lag behind teachers of other subjects. Freely admitting our short-comings, we have the right to say, "The demands made upon us render our problem one of the most difficult of solution in modern education. Blame us not, if, on one hand, we report no more than that we have made progress; if, on the other, we undertake to assert that our methods will not be those of natural science alone, or of the teacher of mathematics alone, or of the teacher of foreign languages alone, but, while having something in common with each, will necessarily have something more than all.

Still, our trust in what will be, must not blind us to what is, must not harden us to our present errors. One prevalent evil in English, now-a-days, it seems to me, is lack of definiteness. In the schools of our childhood, when grammar was grammar and not language, you and I, as students, spent a good deal of time in making diagrams and in writing out the parsing of words. It is now the fashion to assert that we wasted many precious hours, that we did this and that by rote, that we had no interest in our work. Yet I cannot be alone in remembering

that many boys and girls of that time took delight in drawing the lines about or beneath those carefully arranged parts of speech, and that they got together with no little eagerness to find who had found the way through the labyrinth of some difficult passage, and that they felt a genuine thrill of triumph at being able to settle the exact syntax of some obscurely related word. Maybe that kind of work is old-fashioned; but it certainly did lead a pupil in the grades to have definite ideas and to do definite things at definite times. He had so much English to prepare, and he prepared it, just as he worked out a certain number of examples, or located a certain number of cities or described a certain number of rivers. He knew that he must get his lesson by Monday since the teacher would demand on Tuesday, not only an equal amount of new work, but also whatever had been left unfinished on the day before. It never entered his head that he might run the risk of his teacher's not getting through with the lesson. She always did get through; and he early learned that it stood him in hand to know his grammar well at the appointed time.

At present, whatever may be the conditions in the grades, the work in English at our high schools and colleges is far from being properly definite. A specific amount of preparation is not demanded for each meeting of the class; lessons may be assigned with more or less regularity, but they are not called for at expected times; pupils are told to prepare a theme, but are too seldom given instructions about the selection of the subject or the method of development; and they often receive the appalling information that they will be held responsible for every word needing explanation in the next act or in the next five hundred lines. Is it any wonder, then, that our pupils come to us with ill-prepared lessons, that themes are late or over hastily written, that to our most carefully worded question we receive a disheartening reply, whether it take the form of the polite, "I haven't got so far as that," or the ruder, "I dunno."

But wherewithal shall we as teachers of English cleanse our way? By taking definite heed thereto. Instead of saying, "Write a narrative for to-morrow," give the direction, "Make up a story about an organ-grinder, a monkey, a boy, and a bag of candy." Such an assignment puts the minds of the pupils to work just as it has already put yours to work at the present

moment. Instead of calling for a description, say, "Tell me about something on your desk, at home. Imagine yourself in my place and include every detail necessary to give me, who cannot see the article, a complete picture of what you are trying to describe." As an exercise in exposition, topic-sentences may be dictated for development in one way or another; subjects as abstract as *charity* or as broad as *railroads,* long taboo to makers of rhetoric, may be assigned with the direction first to make them concrete and definite by putting down some topic-sentence which they suggest, and then to enlarge this to a paragraph by repetition, or application, or the presentation of examples, details, causes, results, or proofs.

A special kind of exercise in composition may here be emphasized. May I call it, *practice by imitation?* It consists first of all in having a model paragraph or even a sentence so closely studied by a pupil that he clearly sees the exact formation of each part and thoroughly understands the several means of articulation used. This done, he next puts his knowledge to practical use by casting some thoughts of his own into the same mould so that the structure of his sentences shall answer to that of the model, word by word, phrase by phrase. Such practice leads to a breaking up of the tendency to write long rambling sentences devoid of unity; it makes against the use of dangling participles, and of the so-called *and-which* habit; it helps to the mastery of the periodic and of the balanced sentence; it gives conscious power over the ways and means of bringing about good paragraph development.

In the teaching of literature, assignments, so far as possible, should be possesed of unity. In *Ivanhoe,* for instance, the first six chapters treat the events at Rotherwood, the next eight those of the tournament, the next four those in the forest, and so on. Should any of these divisions seem too long for one day's work, it may be given for two; but recitation upon the work should take place at the appointed time and should cover the whole amount assigned. In teaching essays, an instructor acts unwisely if he demands an outline without giving some help or suggestions for its making. Such help may be imparted in class, sometimes by leading pupils to discover the catch words of the various paragraphs, sometimes by giving the skeleton of an outline, that is, the numbering of the heads and sub-heads with

some indications of the plans where the various topics may be sought. Nor is it unwise at times to have a recitation with open books in which, paragraph by paragraph, the pupils underline the topic-sentences as they are discovered under the adroit questioning of the teacher. I have known this method to be attended with striking success in teaching Burke's very difficult *Speech on Conciliation with the American Colonies,* and, more than this, some pupils have in this way learned how to get all lessons which depend on analysis of thought rather than on memorizing of words.

Finally in the matter of the study of dramas and poems a suggestion or two may perhaps be pardoned. Here in addition to an acquaintance with plot, or development of thought, the pupil must concentrate a considerable amount of attention upon words as words. Therefore, instead of saying, "Take the next act," or "Study lines 100 to 600, and be ready to make all necessary comments," ask the members of the class to bring in five examples of similies, or to be able to explain four allusions, or to show peculiarities in the use of a list of words drawn from the text. Split the class into groups, if need be, and make the first section responsible for certain definite things on page one, the second for similar definite things on page two, and perhaps all for definite things on page three. Assigned in this way the texts for reading and those for study in the preparatory schools will be actually read and really studied, since the pupils will know definitely how to attack them from one vantage point at least.

The problems of the teaching of English are not essentially different in the preparatory school and in the college.

"Only the scale's to be changed, that's all."

The freshman of the present day, whatever his years, is so very young as to need the most definite directions; and the senior is so far from being marked by seriousness in his attitude toward his studies as professedly to elect courses in English, because the instructors, demanding no definite work, day by day, permit him to get on with no definite preparation at definite times; and thus give him good ground for speaking, in his indefinite vernacular, of the study of English as a—*cinch;* of his instructor as a—*peach;* and of the particular course as a—*pipe.*

If this paper upon the lesson-assignment in English, with its insistence upon a single point, has in any way given offence, or

seemed over-dogmatic, I ask your forbearance. I do not for one moment flatter myself that I have solved the difficult problem of teaching English; perhaps I have not made even a contribution to its solution. I do believe, however, that more definite methods in our work will go far towards removing our reproach from us. For that reason I have ventured to call attention to some of the ways in which not a few of us err, and for the same reason I have run the risk of appearing patronizing and perhaps arrogant in suggesting certain methods of making our work more practical by making it more definite. Certainly no one can doubt that definite directions and definite demands lead to definite preparations and definite results.

GENERAL DISCUSSION.

MISS MARGARET COULT.—Mr. Erskine's paper advocates the use of composition as a preparation for the study of literature. My discussion of this subject shall be from the high school point of view. Our methods should be normal, simple, obvious. I think too often we distort our methods from the simple and natural. The best guides that we have, perhaps, are our own minds—the way things come to us. If I have a piece of literature to present to a class, we can question ourselves about how that particular thing made its appeal to us, and, as far as possible, help our pupils to approach it in the same way. Next, we have the recorded experience of others.

In the first place, I should stand very strongly with Mr. Erskine in what he says about the desirability of making literature a subject for composition. It doesn't seem to me that any serious and really vital study of literature can be made unless the composition is joined with it. Now, preparation for the presentation of a piece of literature is most desirable. Often, I think, the trouble with a class is a blank failure to comprehend the purport of the poem or essay to be studied. For instance, suppose the subject be Milton's lyrics: the thing is so far from the experience of the pupil, the language too near to an unknown tongue, that the first impression is likely to be confusion. It seems to me that the suggestion that has been given about the use of composition as a preparation for the study of such a poem is entirely feasible. As I listened to the paper I tried to apply the notions presented to my own case. I have attempted some

similar expedients. In the study of L'Allegro and Il Penseroso I have asked the pupils to write a L'Allegro and an Il Penseroso, not necessarily in verse, but frankly and simply to give their own ideas of what a happy mood or a thoughtful mood to them personally means. I have asked them, too, to experiment in meter; and I have always felt that the comprehension of the metrical form is much more complete after they have made their attempts. For instance, a sonnet means infinitely more to the pupil who has tried to write a sonnet; and some of them not only try, but succeed in managing with tolerable dexterity the complicated rhyme of the sonnet. I like to ask pupils to attempt the Spenserian stanza. I have not done that as preparation for the study of Spenser, but I have done it during the reading of Spenser; but whether it is done at one time or another, some feeling for the form is gained by the doing. The next time I think that I shall have my L'Allegros written *before* we attack our Milton.

To my mind, the main trouble in the comprehensions of poetry is that our pupils have not read enough poetry. The fact that most men don't like poetry is, I think, because they have not read poetry. The language of poetry is unknown to them; it is a sort of foreign tongue, which must be learned; and it seems to me that it should be learned early. It sometimes takes a sort of savage pleasure in making the boys say over the lines about fame, in Lycidas: just for the sake of soaking them in the poetry. I am very sorry for the people who grow up cut off from the joy of poetry. I believe it is in very large measure because they have not read it early and read it much.

Now, the idea of using composition as a preparation for the study of literature is an interesting one, and I think feasible in some cases; but the other process, too—writing on the inspiration of literature—is sound too. All history of famous writers shows that they began as imitators. Stevenson calls himself a sedulous ape. They all experimented in styles, before they found their own; and I think that frank writing on the leading of literature is a sane method. Literature kindles literature, and has done so since the world began.

Again, as to the point about literature and composition: I do not believe that composition work should be chosen exclusively from daily life. I think that literature in a way gives a somewhat truer view of people and things to young people than the actual world. They do not see the actual things very clearly,

and literature is a sort of Lady of Shalott glass in which the shadows of the world appear; and from that they can be led to look down upon Camelot itself.

I myself have never been brought to see the iniquity of asking the pupils to write their own opinions about the literature they read. I often find they write very much more freely than they talk. When they rise in class to talk about the things that they have studied, they are embarrassed by self-consciousness; they are afraid that someone will laugh at them as sentimental and emotional; but in the confidence of the theme that is really between them and the teacher, there is often a great deal more straight and simple and genuine expression of feeling.

Now as to the other point that we have before us—the point of definite lesson-assignment. I think that we should all agree as to the desirability of definiteness, at least, so far as this goes —that each lesson-assignment should be absolutely clear and comprehensible, and that the teacher should, in each case, know what he wants accomplished and know most definitely how that thing is to be accomplished. But there is a definiteness that, I think, defeats itself. Sometimes a definite task set, say in the study of a poem, simply obscures and evades, instead of clarifying and enlightening. Pupils like a definite task, and they can do a definite task: they can pick out twenty words of one sort or twenty words of another sort, and list you peculiarities to the end of time: but such a process does not always get to the main thing in hand. The definite lesson plan is easy not only for the pupil, but for the teacher: it is very easy for a teacher to follow a sound form of words; but the sound form of words sometimes misses the point, rather than hits the point. I had occasion to expostulate with a teacher for following a very definite form for a report upon home reading, a rather disconnected lot of details that seemed to me to come to nothing. I spoke to the teacher about it; and she said, "I like the plan. The children can work it out, and it keeps them from rambling"; I think that with gentle persistence she is using the plan still, and with such illuminating results as the following: "Archaic words —Example, 'odds fish! Specific words—Example, One." Sometimes we must say, "Upon this point I can give you no more definite leading than this: you must think the matter out for yourselves; you must form your own plan; you must make your comments; you must express your own ideas."

It seems to me that one of our troubles, one of our failings, is that we do not give our classes enough initiative, do not teach them how to attack a subject, how to see for themselves the things that are salient. This I think that we should attempt to do. The results may be less in amount, and they may not be in such good form; but I think that they will mean more, and give more power.

PROFESSOR JOHN ERSKINE, COLUMBIA UNIVERSITY.—I suppose a freshman illustrates the effect of the teaching of literature in the schools; and I find from my freshmen in the different institutions in which I have taught that their chief fault is intellectual dishonesty. I spend most of the year trying to stop my freshmen from saying that the particular play of Shakespeare they choose to write on is an interesting one. They have learned to say those things from somebody; and I take it they have learned to say them from us. You can use literature as a model for writing; and it is true that literature kindles writing; but I know of no writer who has become great because somebody told him to imitate something else. The great writers do imitate at their own wish; and if any of our pupils imitate because they are kindled by literature, let us thank God; but it doesn't happen often.

If we use literature as a model for writing we must say something about it; and our pupils are looking forward to that examination, and they store away whatever we say: it comes out on the papers, and whether or not they understand it is a problem; and usually they do not. You can find out the teacher through what the pupil says; and some of the worst pupils make the most forlorn attempts to reproduce what they never understood —didn't even hear straight. One pupil last year in the examination spoke of the Puritans as having been very full of the "descendendance of descent."

I agree with Miss Coult that we ought to make the pupils see for themselves in literature what is to be seen. I have never heard any recipe for doing that, except my own suggestion, feeble as it is. We have no method if we simply tell them, "Go see for yourself." We have no method if we simply say: "See this, that, because they are so"—in that case they see it in order to pass the examination:

As for

"The forty (cows) feeding as one"

I think I forestalled that in what I said about the teacher's being a philosopher or poet. If we have such an idea, can derive such ideas from nature, we may be poets, but just how to apply such an idea to the teaching of English literature I myself don't know; and I should like to be informed.

PRINCIPAL W. D. LEWIS, WILLIAM PENN HIGH SCHOOL, PHILADELPHIA.—I regret very much that the allurements of the steel works kept me from hearing the papers this morning. I did hear a part of the discussion, and it seems to me that one point, one which is perhaps more vital to the discussion of our teaching of English than any other one, was touched upon in that discussion. That is, the union of literature and composition —the basing of the composition work upon the literature. I don't know but I have gauged our results wrong; but I have been very suspicious that a large amount of our teaching of literature has defeated its own end; because we don't find on the part of the students who are taught by the traditional method—the method that is practically prescribed for us by the necessity of meeting the college entrance and college board examinations, and those that have been prescribed in New York State by the Regents—the discriminating taste for literature that it is our aim to develop. The methods have not, it seems to me, created a love for literature, an appetite for literature, that would make a child read more of the same author—nor that would take him back to the books that he had read, to read them over again, to make him glory in those great ideals that are studied in literature better than they are studied anywhere else, and that certainly ought to become a part of the real culture element of the student's residuum from his school training.

It has seemed to me that the difficulty lies largely in the fact that we emphasize facts *about* authors, *about* literature, rather than the literature itself. This leads him to do just what the previous speaker mentioned, when he said that the students were giving ideas about plays which were not genuine; they were not their ideas concerning the plays: they were talking about the "descendency" of dissent. Every teacher of English has had parallel experiences.

It seems to me that the thing that we should do is to separate the literature from composition entirely; that our aim in teaching literature should be to get the pupil thoroughly enthusiastic over the literature, that he should love the literature, that he should want to go on and read more and study more and get more out of the literature because it appeals to him; and certainly there is in our literature enough that can and will appeal to the varying tastes and peculiarities of all our boys and girls. If, on the other hand, we are thinking about the examination that is just ahead; if we are thinking about the discussion of the literature we must give on a college entrance or a regents' paper, we defeat the end.

To illustrate—suppose you were to set the task of telling in prose about the scene between Arthur and Guinevere at Almesbury. That bit of magnificent poetry, perhaps the finest that Tennyson ever wrote, would become as dry and dead as the solution of a problem in algebra when it was reduced to the commonplace English of a high school theme. Such an effort certainly takes away the consecration and the poet's dream that ought to settle in the child's mind around that piece of literature. What do you get from this method of basing composition on literature? You get this insincere discussion *about* literature. You get a story that Scott has told better than the child can possibly tell it. He is so well aware that this is the fact, that the thought that he must tell it is disheartening. He is telling over something that he doesn't want to tell. Now, if you can get him to tell something that he does want to tell—and these boys and girls have experiences that they are very anxious to relate—I believe that you will get genuine work, and that you will have given them less red ink, if you are still red-inking, than by the other method. You will get a kind of work that is just what he must do all his life: he will be obliged to give a good, clean-cut exposition of what he has seen and done; but he is a long way further on the road toward writing literature in doing this than he is in reproducing the stories of Longfellow, or Scott, or Tennyson, or Shakespeare, or any one else.

Let us separate these two. They were united twenty years ago, when the study of English began; because nobody knew what we wanted to do with English. We were all feeling our way; we felt that we must set a definite task; a task that must be

examinable, so we learned the details of the stories and examined on the content of literature. We broke away from the lives of authors and developed very learned and very uninteresting discussions of the literature. Those boys and girls are not ready to discuss it, but they are ready to love it; and I believe, with a previous speaker, in soaking them in it, so to speak. I do not believe, however, in soaking high school students *with* literature that is utterly beyond them, like Lycidas.

THE PRESIDENT.—I would like to call on the Secretary to take part in this discussion.

THE SECRETARY.—I have listened with a great deal of interest, as a teacher of English, to the discussion of the papers this morning, and in the first place I wish to speak of a point, which is the practical one raised by Mr. Lewis, namely, the separation of the tests in composition and literature in the entrance qualifications for college. That has been a hobby of mine for some time; and I have been preaching it privately to all who would listen. I at one time had to prepare questions for entrance to college, and I was struck with this practical difficulty. In "English A" we require the writing of a composition, and also answers to questions upon the books which purport to have been read by the class. In "English B" we have some more definite questions upon books. Now, a candidate tries the entrance examination in "English A" and he may receive a condition, because he writes bad English. He may have read the books, but all he knows is that he is conditioned, and so he goes back to his school or to a private tutor and reads the books over again, because he doesn't know *why* he is conditioned. He thinks it is because he has not read the books, or because the instructor has found out that he has not read the books. If we could more definitely separate "English A" and "English B," then do away with the preposterous list of books in "English A" and give the candidate for college under "English A" simply the writing of a composition—and I believe in taking subjects from actual life, notwithstanding all that Professor Erskine has said—if we could let him answer in "English B" the questions upon the books; then, if he fails in "English A," he will know why he has failed: if he fails in "English B," he will know why he has failed. We would then not have that present diffi-

culty that I have met with again and again, in my own experience, and which I have no doubt that high school teachers have met with very much more frequently.

I have talked with the Conference Committee which represents this Association; and they tell me that high school teachers like to have a long list of books given to them under "English A." I have never met a high school teacher who liked that list of books. I believe that he exists in the imagination of the committee; or, at least, the committee has been informed by some few teachers whose thought lay in that direction; but I don't believe that there is any really efficient high school teacher who wants to be told what books to teach his students.

I think if the Conference Committee on Entrance English would trust high school teachers as to the general reading of literature, and would simply ask a certain definite number of questions upon a limited number of books under "English B," we would arrive at a very much more simple, satisfactory state of mind. I don't know whether the suggestion will be carried out; but it is certainly a practical suggestion.

With regard to another point raised by Professor Erskine—I am not convinced, notwithstanding the excellent examples of Benjamin Franklin and others, that a man is made great by imitating the style of any one else. He ought to be brought in contact with literature, as much as possible, in order that unconsciously he may imitate good style; but I do believe (and I have had a number of years' experience as a teacher of college composition) that if you give a boy a subject such as the description of the outside of the building or the inside of a building, or the character of a friend, or any definite, concrete subject of that kind, you will get a much better result than if you had asked him to describe a novel, or write about a piece of literature. From the point of view of logic I was interested in what seemed to me the somewhat circular method of argument in Professor Erskine's address. The student, he says, is not interested in telling about matters which come to him from actual life, and (if I am misquoting him I hope he will correct me) has no more definite idea about those matters than he has about a piece of literature. But Professor Erskine is going to teach him to start at the beginning to write about matters suggested by the Deserted Village, and is depending for that writing upon the past of the student's own ex-

perience, in which he has no interest. If he has not those ideas at the beginning, he cannot give them to us as an introduction to a piece of literature: if he has those ideas, I believe he will be much more interested in telling about his actual experience than if they are leading up to the Deserted Village: he will suspect the drift and he will suspect that we are leading him into literature in a way he doesn't want to go.

I feel, myself, that after all, it is life that the greatest writers have chosen to write about; and that when we are teaching high school or college students to write, they ought to imitate the methods by which great writers have themselves succeeded; that is, by getting their subjects from life, and writing frankly and freely about it.

I don't wish to deal with the other side of the question—that of interpretation and appreciation—at all; that is a widely distinct and separate thing and I think Mr. Lewis has said enough about that, and has put it very briefly and succinctly. Let us free our study of literature of the dread of the examination. If we can do that, we can accomplish a great deal more in teaching it. Let the dread of the examination, if there must be dread, rest upon the composition; and let the students feel that they must come to college prepared to write English. If they do that, and in addition have even begun to appreciate literature, we will be only too happy.

G. P. Bristol, of Cornell University.—It was with some hesitation that I arose, standing as I do outside the ranks of those officially connected with this work; but I am glad to say that, standing outside, and having it as a part of my duty to go into a good many high schools, my sympathies are all with the teacher of English to-day. The teachers are criticised for the failure of the students to come up to certain standards, and to do certain work; but it seems to me the teacher of English has a peculiarly difficult place. Nobody teaches outside of the class-room that 5x5 are 26, or 27, or 30; but in many of your schools —some of your schools, at any rate—everybody outside of the class room is teaching unconsciously, but none the less teaching, that "I would have went" is proper. In this way, the effectiveness of what you are doing to bring to the notice of your pupils, the habits that you are trying to form in them—correct expres-

sion—during the few periods in five days of the week, you have overbalanced in all the other waking hours of the week by teachers of what is faulty and incorrect; so that it seems to me that the teacher of English in the school has far and away the hardest task of any teacher on the force.

I listened with a great deal of interest to the statement—I think it is true in a way—that our pupils are less fond of reading books than they used to be. But perhaps we should not be disheartened, after Mr. Mitchell's very frank statement. He read the Saturday Post on the way up. Now, I think if he had known that he must pass an examination on the contents of the Saturday Post, he might have read with more attention, and perhaps more profit, those things which he thought would be picked out as important by some one else and not by his own judgment. I do believe, speaking as an outsider, and with some hesitation—I do believe in basing composition upon books. Because there is something in the life that is portrayed in literature which does touch the life of the young student, though he is not conscious of it. The universality of life in literature must come somewhere near his own experiences, present, or to come in the future. You awaken in him, perhaps, a suggestion that he has had an experience similar, and he realizes that this experience was expressed, far better than he could express in his own language, in the poem, article, or essay he was made to study.

I believe most thoroughly in bringing home to the student, if possible, the nobler aspects of life through all his reading and in the books we love to read because we love old friends and old experiences. It seems to me that if expression in language is to be confined to the pupil's own experiences, it can never help him to a richer experience. Just one point more specifically—it seems to me that composition, or work in connection with books, will help incidentally to an active and somewhat wider range of expression. I have noticed, during the last four or more years now, the range of expression of thought denoted by the richness or poorness of vocabulary in adjectives. The average student, college and other, is wonderfully lacking in power to use adjectives correctly. I have a collection (such as every philologist likes to make), and have noticed the expressions that come and go. "Dandy" is at present almost universal for praise. It is not of very long standing. I presume it will

disappear in time. A little while ago "Out of sight" was the supreme excellence. I have rather made up my mind that just now students are remaking certain categories in grammar; and I am inclined to think that "bad" is compared in this way: Positive *bad,* comparative *rotten,* superlative *fierce.* I have heard is so often I begin to think that may actually work into the language—that we may have to learn it as an irregular adjective at some time to come.

So, it seems to me, we cannot get that discriminating power of expression which is exhibited by the command of adjectives, except we base the teaching in some way upon themes which call for discriminating thought and discriminating use of adjectives; and with all due apologies to the experts and with some hesitation I venture to make this suggestion.

Dr. W. L. Leighton, Lehigh University.—In a talk on science yesterday, Professor Franklin pithily told us that he didn't want my dilettantes in his department taking a course in physics for the sake of culture; for such a procedure was like putting pickaxes in one's parlor for ornament. It is characteristic of us Americans, indeed, that in order to be vitally interested in anything—physics, English, or whatever else—we have to see the "use" of it.

Here at Lehigh University, where the dominant spirit is "Technical" rather than "Liberal," English is prone to receive from some quarters short shrift. A fellow-instructor, in fact, in one of our Engineering departments, pitched into me only the other day in a half humorous and half serious vein with the observation that it was really a shame for us English instructors to take salaries from the university for teaching such a profitless subject as English. And the technical students, themselves, of whom I have large numbers in rhetoric and composition, are liable at the outset to assume a nonchalant attitude toward their course in English under the illusion that it is useless.

The truth of the issue is that the study of English—Rhetoric and Composition along with Literature—has for the technical man as well as for the College-of-Arts man direct twofold use—humanitarian and utilitarian. Matthew Arnold devoted most of his life to upholding the "use" of the Humanities; pointing out to us how sore is the need in our midst for sweet reason-

ableness, how the arts—literature among the others—help to recreate us, to render us more sympathetic and amiable, to provide us with the means of enjoying life and everything in it the more. And many a Technical man, after he has made his pile and bought a lot on Quality Street, discovers sometimes at bitter cost how invaluable a surer and more gracious command of English would be to him in both humanitarian and utilitarian respects: serving him in a commercial way in gaining the ear of bank presidents, railroad magnates, and whomsoever else on whose favor depends the increase of his business; serving him in a social way by enabling him and his family to be more pleasantly compatible in the homes and clubs of well-bred people; and serving him in good stead along such purely professional lines as the drawing up of carefully phrased specifications for tricky contractors, the framing of properly worded regulations for cranky employees, and the setting forth with power and skill in speeches and articles whatever scientific information he may in time acquire that would be of benefit to the public present and future.

Realizing, then, this double value—on Humanitarian and Utilitarian grounds—of the study of English, and recognizing, too, the tendency of the American people, students and others, to disparage whatever they fail to see the "use" of, it behooves us instructors in English to try to drive home from first to last, especially among the Technical students, the "use" of English.

I wish to acknowledge indebtedness to Professor Franklin for the sensible policy that he advocates as regards creating among students the eventual-use attitude of mind.

Miss Margaret Coult, Newark High School.—Just one thing: I think I am in the minority in regard to this matter of composition based upon literature. I am a little astonished at the trend that some of the speeches have taken. It doesn't seem to me that the basing of composition upon literature means necessarily the reproduction of stories, in the language of the pupil. It seems to me that the field of composition in that line is very much wider. I do not think that we should base composition wholly upon literature. We should lead from literature to life. I speak from a little experience, and I think there is a basis of fact for some of the things that I have said. I followed

the result in a grammar school class of the study of Dickens' *Tale of Two Cities,* in the compositions that were written under the inspiration of that theme. If the class did not improve, then the evidence of the compositions goes for nothing. I am quite sure that they did. I should like to take issue upon something else stated: I think that the pupils do enjoy composition work based upon literature. I think that if they are interested in what they are reading, they enjoy both talking about it and writing upon it. I think that they have just as good a right to express their opinions upon that as upon anything else. You don't think that they can feel very deeply; but I think pupils can feel deeply about what they study. I think they have opinions. They are not very wise opinions, not always very sound opinions; but I think they have opinions. I cannot quite understand the apologetic tone that is sometimes taken in regard to the study of English; I think it means mightily to classes; and I think it affects them.

Professor Charles K. Meschter, Lehigh University.—I do not wish to leave this meeting without casting my vote on the side of choosing composition themes from the experience of the student. Such topics, I recall as both pupil and teacher, have in the main been most profitable and most pleasant for the young writer. We heard last evening in the able address by Dr. Green that the purpose of education is to understand life. Assuredly, the composition that requires the writer to express his experience, however meager, helps him apprehend life a little better at least. At any rate, what is the purpose of English composition? This object surely is to enable the student to convey his thought and feeling in the best form and the most apt diction. Persistency in this equips him with adequate and felicitous language in manhood.

It seems to me that in our discussion this morning we have to some extent misjudged when the composition drawn from experience and the composition drawn from books should be required. For the child with his paucity of book knowledge and his feebleness of critcal power, but with abundant experience in child-life, the former is the better. Furthermore, there is no occasion to belittle so-called trite themes. I recall a most creditable composition on a burning barn by a boy present, an excellent oral composition on snakes by one who had certain species as

his playmates in his mountain home. Such productions push into the shadow the depreciation of "soda water" themes. Burns saw fit to write on a mouse; Swift on a broomstick. In truth, there is no reason why an English composition should be regarded as a means to pour knowledge, other than that of the use of language, into the head of the student. Research indeed is too frequently not conductive to good work in composition.

On the other hand, the student in the upper years in college, with his dawning powers of reason and mental penetration, is capable of written work on some exacting topic from a book. While this one writes a production of some interest on *Macbeth*, the other expends his energies on the same in futile effort only. The less advanced pupil is aroused to writing pitch by an entirely different kind of theme.

Even further distinctions of subjects than that already made should be realized. The list of topics for the country pupil in order that he may do his best work should be different from that for the city pupil. In truth, the series of themes should be as flexible as the difference in classes and in individuals, in order that the best results may be attained.

Moreover, minds are divided as to whether courses in composition and in literature should be unified or separated. The book course in composition tends to unify them, and the experience course to separate them. The latter is doubtless a good thing for the younger student. Indeed, there is no reason why the two courses should ever be combined. Without the unification of them the leaven of literature can work most effectively, and with their unification the consistency of the resulting loaf may annul the leaven. Though there is no coalescence of the two courses, the student, just as he acquires the language, often bad, of the people with whom he associates, can absorb the diction of literature; and literature whenever deeply inhaled always oxygenates the blood.

Professor Louis Bevier, Jr., Rutgers College.—I had no intention of rising to a discussion which is foreign to my own teaching—not, however, foreign to a very intense and sympathetic interest. But it does seem to me that the chivalry of the sympathetic teacher ought to say a word from outside of the ranks, of specialists in English, and an appreciative word: I am,

strictly speaking, neither outside, nor inside the ranks. I have had large experience in observation of the teaching of English: very little experience in the actual teaching. And I think the great and pregnant sentence, many times recalled and repeated, from Plato, has a point here. Many of you remember, of course, that he said "Unless the philosophers shall become kings, or the kings philosophers, there will never be a surcease of woes to our cities."

So for our purpose: "Unless our philosophers and poets become teachers of English, or our teachers of English become philosophers and poets, there never will be a surcease of hostile criticism against the teaching of English in our colleges and secondary schools." And it is perfectly plain why. It is an easy thing to teach mathematics fairly well; I never tried it, so I know; but who can teach a fine art but the artist—and even he very imperfectly? The whole essence of the teaching of English is of the nature of teaching a fine art; and there is no one royal road, either through essay subjects taken from life or through subjects taken from literature. We have simply two sides of one shield. The one teacher of English gets vastly better results, from essays on "a cow," than that teacher could possibly get from an essay on "sublimity"; and another teacher cannot handle the cow at all, and ought never to try.

I was quite profoundly touched many years ago when as a result of the teaching of a friend of mine who is a successful teacher of English, a little girl of seven came to her one morning (all of you who are teachers of English will at once place the date) and said, as to the death of Oliver Wendell Holmes: "Do you know that the poet who has been writing poetry for our class, is dead?" She had already in some measure the literature enthusiasm and the literature touch, the beautiful spark had certainly been kindled in her by some artist touch; on the other hand, the intensely practical sometimes brings out a masterpiece. It was only a few years ago when a question in the entrance examination in English at an institution that I know pretty well, was set in this form: "Write sentences illustrating the use of the modes of the English verb"; and the answer written on the paper was as follows: "*I am taking* the examination in English. *If I answer* eight questions I shall pass. *I may pass* if I answer only six. God *help* me!"

MISCELLANEOUS BUSINESS.

First Session, Friday, November 25.

The President appointed the following temporary committees:

On Nominations—Dean Edward H. Griffin, of Johns Hopkins University; Dr. J. S. Walton, of the George School; Professor Louis Bevier, Jr., of Rutgers College; Professor G. P. Bristol, of Cornell University; and Mr. Fletcher Durell, of the Lawrenceville School.

On Audit—Professor Daniel W. Shea, of the Catholic University of America; and Principal Stanley R. Yarnall, of the Germantown Friends' School.

On Resolutions—President Thomas Fell, St. John's College, Annapolis; Miss Alice H. Byrne, Miss Hills' School, Philadelphia; Professor John A. Stahr, Franklin and Marshall College.

Fourth Session, Saturday, November 26.

THE PRESIDENT.—I will now call upon our Secretary for a Treasurer's Report.

THE SECRETARY.—As a word of preface to the Treasurer's Report, which will be read in a moment, I would like to state, for the information of the Association, that on July 10, 1910, Dr. John B. Kieffer, Treasurer of the Association, died at Lancaster, Pa. The Secretary, on receipt of this news, consulted the President of the Association as to the proper course to be taken to secure the funds of the Association. It was deemed unwise to hold a meeting of the Executive Committee at that time owing to its being the vacation season, and acting under the power of attorney given him by the President of the Association, the Secretary went to Lancaster and received from the executrix of the estate of Dr. Kieffer the funds of the Association, and such papers as were in her possesion. These funds were deposited by him in the Centennial National Bank of Philadelphia in the name of the Association, with the approval of the President, and are now subject to the order of the Treasurer to be elected.

That will explain the form in which the report is made.

TREASURER'S REPORT.

To the Association of Colleges and Preparatory Schools of the Middle States and Maryland.

GENTLEMEN: The following report of the condition of the treasury for that portion of the fiscal year of the Association from November 22, 1909, to August 5, 1910, during which the funds of the Association were in the hands of the late Dr. J. B. Kieffer, or his estate, has been prepared by the Secretary from the books of the late Treasurer.

RECEIPTS.

Balance on hand November 22, 1909, including certificate of deposit for $300	$382 93	
Interest on certificate of deposit, January 19, 1910	10 50	
Membership dues, 1908-09, 8 schools	40 00	
Membership dues, 1909-10, 152 schools	760 00	
Membership dues, 1910-11	.....	
	$1,193 43	

DISBURSEMENTS.

Executive Committee expenses	$88 87	
Clerks and stenographers	101 76	
Postage and expressage	68 58	
Printing and Stationery	451 45	
Salaries	150 00	
Expenses—Visiting speakers	19 50	
	$880 16	
Balance		$313 27

For the remainder of the year, the following report is submitted:

RECEIPTS.

From estate of John B. Kieffer, including certificate of Deposit for $200	$313 27	
From membership dues, 1909-10	5 00	
From membership dues, 1910-11	5 00	
From interest on Certificate of Deposit, August 8	3 00	
	$326 27	

DISBURSEMENTS.

To postage and expressage	$15 40	
To expenses of Executive Committee	6 06	
	$21 46	
Balance		$304 81

TOTAL RECEIPTS DURING YEAR 1909-10.

Balance on hand November 22, 1909	$382 93	
Interest on certificate of deposit, Jan. 19, 1910	10 50	
Interest on certificate of deposit, Aug. 8, 1910	3 00	
Membership dues	810 00	
	$1,206 43	

DISBURSEMENTS.

Executive Committee expenses	$94 93	
Clerks and stenographers	101 76	
Postage and expressage	83 98	
Printing and stationery	451 45	
Salaries	150 00	
Visiting speakers	19 50	
	$901 62	
Balance		$304 81

The report was, on motion, accepted.

REPORT OF THE AUDITING COMMITTEE.

Your committee to examine the accounts of the Treasurer for the year ending November 25, 1910, reports that it has examined both the accounts of the late Dr. J. B. Kieffer and of the Secretary, who has been acting as Treasurer since Dr. Kieffer's decease, have compared the list of payments with the vouchers and find them correct, and report that there is a balance of $304.81 to the credit of the Association on deposit with the Centennial Bank of Philadelphia.

(Signed) DANIEL W. SHEA,
STANLEY R. YARNALL.

This report was, on motion, accepted.

REPORT OF THE NOMINATING COMMITTEE.

For officers of the Association for the ensuing year we recomment the following gentlemen:

President.

President THOMAS FELL, St. John's College, Annapolis, Md.

Vice-Presidents.

Dean HENRY B. FINE, Princeton University, Princeton, N. J.
Professor GEORGE M. FORBES, University of Rochester, Rochester, N. Y.
President EUGENE A. NOBLE, Goucher College, Baltimore, Md.
Principal HERSCHEL A. NORRIS, Friends' School, Wilmington, Del.
Director EDWARD RYNEARSON, Pittsburgh High School, Pittsburgh, Pa.

Secretary.

Professor ARTHUR H. QUINN, University of Pennsylvania, Philadelphia, Pa.

Treasurer.

Principal STANLEY R. YARNALL, Germantown Friends' School, Germantown, Philadelphia, Pa.

Executive Committee.

Principal JAMES M. GREEN, State Normal and Model School, Trenton, N. J.
Professor THOMAS S. FISKE, Columbia University, New York City.
Professor JOHN L. STEWART, Lehigh University, South Bethlehem, Pa.
Director THOMAS S. BAKER, Jacob Tome School, Port Deposit, Md.

The Secretary was, on motion, instructed to cast a ballot in the name of the Association for the above-named officers, and they were accordingly declared elected.

REPORT OF THE EXECUTIVE COMMITTEE.

The Executive Committee begs to report that the following schools were admitted to membership in the Association during the year 1909-10:

Bloomfield High School, Bloomfield, N. J.

The Rand Collegiate School of Trenton, having ceased to exist, is dropped.

The Executive Committee during the year entered into correspondence with the History Teachers' Association of the Middle States and Maryland, the Classical Association of the Atlantic States, and the Association of Teachers of Mathematics of the Middle States and Maryland, looking toward an amalgamation of these societies on the following basis—our program to be made up for the Friday afternoon, Friday evening and Saturday morning sessions, with the understanding that the Saturday morning session be constructed so as to admit of departmental meetings of other associations taking place at the same time, and that the Friday morning session be abandoned entirely. The Classical Association of the Atlantic States and the History Teachers' Association of the Middle States and Maryland have not replied definitely. The Association of Teachers of Mathematics of the Middle States and Maryland has indicated that it probably will agree. The Executive Committee asks for authority to carry into effect such a plan.

The report was, on motion, accepted, and the Executive Committee given authority to carry such a plan into effect.

The Committee of Twelve on the Quantity of Entrance Requirements reported progress and was continued for another year.

REPORT OF THE DELEGATE OF THE ASSOCIATION TO THE NATIONAL CONFERENCE COMMITTEE OF THE ASSOCIATIONS OF COLLEGES AND PREPARATORY SCHOOLS.

Professor Arthur H. Quinn, Secretary of the Association of Colleges and Preparatory Schools of the Middle States and Maryland.

DEAR PROFESSOR QUINN: As the representative of the Association on the National Conference Committee on Standards of Colleges and Secondary Schools, I beg leave to report that the

President of the Association, Dr. George E. MacLean, President of the State University of Iowa, has been trying to arrange a meeting of the Committee this fall, but has recently informed me that it will not be possible to hold a meeting prior to the annual meeting of our Association. It is expected, however, that the National Conference Committee will hold a session early in the winter, when an important report of a sub-committee will be presented.

Among other questions referred to this Committee were the terminology of preparatory subjects; including the definitions of "hour," "count," "point," "exercise," "period," and so forth; the quality of preparation for college as demanding attention before further increase in quantity of preparatory subjects is attempted. The other subjects referred to will be found in the printed minutes of the Committee, which were sent to you last year for distribution at the time of the meeting.

Pending the expected meeting of the Conference Committee, your representative has nothing further to report.

Respectfully yours,

HERMAN V. AMES.

This report was, on motion, accepted.

REPORT OF THE COMMITTEE ON THE ESTABLISHMENT OF A COLLEGE ENTRANCE CERTIFICATE BOARD.

NOVEMBER 24, 1910.

Dr. Arthur H. Quinn, Secretary.

MY DEAR DR. QUINN: I beg to report, on behalf of the Committee on the Establishment of a College Entrance Certificate Board, that one college has ratified the Constitution since the last meeting of the Association, making the number, to date, fourteen; and that there seems to be considerable probability that one other college will do so in the near future and make up the required number of fifteen. Colleges which have ratified are:

1. George Washington University, December 2, 1908.
2. University of Rochester, December 7, 1908.
3. Wells College, December 7, 1908.
4. St. Stephen's College, December 9, 1908.

5. Goucher College, December 16, 1908.
6. New York University, December 19, 1908.
7. Lehigh University, December 21, 1908.
8. Temple College, December 29, 1908.
9. Colgate University, January 18, 1909.
10. Swarthmore College, January 22, 1909.
11. Vassar College, February 17, 1909.
12. College of St. Francis Xavier, March 5, 1909.
13. St. John's College, May 25, 1909.
14. Hobart College, December 3, 1909.

Yours very sincerely,

EDWIN S. CRAWLEY.

This report was, on motion, accepted.

The President reappointed Professor Herman V. Ames, of the University of Pennsylvania, as delegate of this Association to the National Conference Committee on Standards of Colleges and Secondary Schools. He also reappointed as representatives of the Association on the College Entrance Examination Board: Mr. J. G. Croswell, of New York; Mr. Wilson Farrand, of Newark; Mr. J. H. Denbigh, of New York; Mr. E. J. Goodwin, of Brooklyn, and Mr. J. L. Patterson, of Philadelphia.

PRINCIPAL JOHN H. DENBIGH, MORRIS HIGH SCHOOL, NEW YORK CITY.—Before the close of this meeting, I should like to move a vote of thanks to the President, Vice-President and Faculty of Lehigh University for their very generous hospitality extended to this Association.

This motion was unanimously passed and the convention adjourned.

LIST OF MEMBERS, 1910-11*

INSTITUTION.	LOCATION.	HEAD OF INSTITUTION.
Adelphi College	Brooklyn. N. Y. (Clifton Pl., St. James Pl. and Lafayette Av.)	Charles H. Levermore, Ph.D.
Agnes Irwin School	Philadelphia (2011 De Lancey Pl.)	Sophy Dallas Irwin.
Albright College	Myerstown, Pa.	Rev. John F. Dunlap, D.D.
Alfred University	Alfred, N. Y.	Boothe C. Davis, Ph.D.
Allegheny College	Meadville, Pa.	William H. Crawford, D.D.
Arundell School for Girls	Baltimore Md. (625 St. Paul St.)	Elizabeth Maxwell Carroll.
Asbury Park High School	Asbury Park, N. J.	Frederick S. Shepherd, Ph.D.
Baldwin School	Bryn Mawr, Pa.	Jane L. Brownell.
Baltimore City College	Baltimore, Md.	Francis A. Soper.
Baltimore Polytechnic Institute	Baltimore, Md. (311 Courtland St.)	William R. King, U.S.N.
Barnard School for Boys	New York City (721 St. Nicholas Av.)	Wm. Livingston Hazen.
Barringer High School	Newark, N. J.	Wayland E. Stearns.
Bayonne City High School	Bayonne, N. J.	P. H. Smith.
Berkeley Institute	Brooklyn, N. Y. (185 Lincoln Pl.)	Julian W. Abernethy, Ph.D.
Bethlehem Preparatory School	Bethlehem, Pa.	H. A. Foering.
Birmingham School for Girls	Birmingham, Pa.	A. R. Grier.
Blair Academy	Blairstown, N. J.	John C. Sharpe.
Blairsville College	Blairsville, Pa.	Rev. N. D. Fiscus.
Bloomfield High School	Bloomfield, N. J.	George Morris.
Bordentown Military Inst	Bordentown, N. J.	Rev. Thompson H. Landon, D.D.
Boys' High School	Brooklyn, N. Y.	James Sullivan, Ph.D.
Boys' High School	Reading, Pa.	Robert S. Birch.
Brearley School	New York City (17 W. 44th St.)	James G. Croswell.
Bryn Mawr College	Bryn Mawr, Pa.	M. Carey Thomas Ph.D., LL.D.
Bryn Mawr School	Baltimore, Md. (Cathedral and Preston Sts.)	Edith Hamilton.
Bucknell University	Lewisburg, Pa.	John H. Harris, D.D.
Canisius College	Buffalo, N. Y.	Rev. Augustine A. Miller, S.J.
Catholic University of America	Washington, D. C.	Rt. Rev. Thomas J. Shahan, D.D.
Central High School	Philadelphia (Broad and Green Sts.)	Robert Ellis Thompson, Ph.D., D.D.
Central High School	Pittsburgh, Pa.	Edward Rynearson.
Chester High School	Chester, Pa.	Joseph G. Smedley.
Chestnut Hill Academy	Chestnut Hill, Pa.	James L. Patterson.
Colgate Academy	Hamilton, N. Y.	Frank L. Shepherdson.
Colgate University	Hamilton, N. Y.	Elmer Burritt Bryan, LL.D.
College of the City of New York	New York City	John H. Finley, LL.D.
College of St. Francis Xavier	New York City (30 W. 16th St.)	Rev. T. J. McCluskey, S.J.
Collegiate School	New York City (241 W. 77th St.)	L. C. Mygatt, L.H.D.
Columbia Grammar School	New York City (34 E. 51st St.)	Benjamin Howell Campbell. Francis F. Wilson.
Columbia High School	Columbia, Pa.	Mary Y. Welsh.
Columbia University	New York City	Nicholas Murray Butler, LL.D.
Cornell University	Ithaca, N. Y.	J. G. Schurman LL.D.
Country School	Baltimore, Md.	S. Wardwell Kinney.

*Members are requested to send the Secretary notice of any changes to be made in this list. The only degrees printed are those of the doctorate, in order to ensure correct addressing.

INSTITUTION.	LOCATION.	HEAD OF INSTITUTION.
Dearborn-Morgan School	Orange, N. J.	David A. Kennedy, Ph.D. Mrs. Abby B. Morgan.
Delaware College	Newark, Del.	George A. Harter, Ph.D.
De Witt Clinton High School.	New York City (59th St. and 10th Ave.).	John L. Tildsley.
Dickinson College	Carlisle, Pa.	George Edward Reed, D.D., LL.D.
Eastern District High School	Brooklyn, N. Y. (Drigg's Ave. and S. 3d St.)	William T. Vlymen, Ph.D.
Eastern High School	Baltimore, Md.	Ernest J. Becker, Ph.D.
Easton High School	Easton, Pa.	William A. Jones.
East Orange High School	East Orange, N. J.	Charles W. Evans.
Emma Willard School	Troy, N. Y.	Anna Leach.
Episcopal Academy	Philadelphia, Pa.	William H. Klapp, M.D.
Erasmus Hall High School	Brooklyn, N. Y.	Walter B. Gunnison.
Ethical Culture School	New York City (Central Park W. and 63d St.)	William E. Stark.
Franklin and Marshall Acad.	Lancaster, Pa.	E. M. Hartman. T. G. Helm.
Franklin and Marshall College	Lancaster, Pa.	Rev. Henry Harbaugh Apple, D.D.
Friends' Central School	Philadelphia (15th and Race Sts.)	W. Elmer Barrett.
Friends' School	Park Place, Baltimore, Md.	E. C. Wilson.
Friends' School	Germantown, Phila. (Coulter St.)	Stanley R. Yarnall.
Friends' School	Wilmington, Del.	Herschel A. Norris.
Friends' Select School	Philadelphia (140 N. 16th St.)	James S. Hiatt.
Friends' Seminary	New York City (226 E. 16th St.)	Edward B. Rawson.
Gallaudet College	Washington, D. C.	Percival Hall.
George School	George School, Pa.	J. S. Walton, Ph.D.
Georgetown College	Washington, D. C.	Rev. Joseph Himmell, S.J.
George Washington University	Washington, D. C.	Charles W. Needham, D.D., LL.D.
Germantown Academy	Philadelphia (Gtn.)	William Kershaw, Ph.D.
Girls' High School	Brooklyn N. Y.	W. L. Felter, Ph.D.
Girls' High School	Philadelphia (17th and Spring Garden Sts.)	J. Eugene Baker.
Girls' Latin School	Baltimore, Md. (24th and St. Paul's Sts.)	Leonard A. Blue.
Girls' Normal School	Philadelphia (1301 Spring Garden St.)	I. Monroe Willard.
Goucher College	Baltimore, Md.	Rev. Eugene Allen Noble, S.T.D.
Gunston Hall	Washington, D. C. (1906 Florida Ave.)	Mrs. Beverly R. Mason.
Halsted School	Yonkers, N. Y.	Mary Sicard Jenkins.
Hamilton College	Clinton, N. Y.	M. Woolsey Stryker, D.D., LL.D.
Haverford College	Haverford, Pa.	Isaac Sharpless, LL.D.
Haverford School	Haverford, Pa.	Charles S. Crossman.
Hill School	Pottstown, Pa.	John Meigs, Ph.D.
Hobart College	Geneva, N. Y.	Rev. Langdon C. Stewardson LL.D.
(Miss) Hills' School for Girls.	1808 Spruce St., Phila.	Mrs. Elizabeth Hills Lyman.
Dr. Holbrook's School	Ossining, N. Y.	Dwight Holbrook, Ph.D.
Holman School for Girls	Philadelphia (2209 Walnut St.)	Frances E. Oliver.
Holton Arms School	Washington, D. C. (2125 S St.)	Mrs. Jessie M. Holton. Miss Caroline H. Arms.
Horace Mann School	New York City	Virgil Prettyman, Ph.D.
Howard University	Washington, D. C.	Rev. Wilbur P. Thirkield, D.D., LL.D.
Irving School	New York City (35 W. 84th St.)	Louis Dwight Ray, Ph.D.
Johns Hopkins University	Baltimore, Md.	Ira Remsen, LL.D.
Kent Place School	Summit, N. J.	Mrs. Sarah Woodman Paul.

INSTITUTION.	LOCATION.	HEAD OF INSTITUTION.
Lafayette College	Easton, Pa.	Ethelbert D. Warfield, LL.D.
Lansdowne High School	Lansdowne, Pa.	Walter L. Philips.
Lawrenceville School	Lawrenceville, N. J.	S. J. McPherson, Ph.D.
Lebanon Valley College	Annville, Pa.	Lawrence Keister.
Lehigh University	S. Bethlehem, Pa.	Henry Sturgis Drinker, LL.D.
Linden Hall Seminary	Lititz, Pa.	Rev. Charles D. Kreider.
Loyola School	New York City (65 E. 83d St.)	Rev. David W. Hearn, S.J.
McDonogh School	McDonogh, Md.	Sidney T. Moreland.
Mackenzie School	Dobbs Ferry, N. Y.	Rev. James C. Mackenzie, Ph.D.
Maher Preparatory School	Philadelphia (1325 Arch St.)	John F. Maher.
(Miss) Madeira's School	Washington, D. C. (1330 19th St.)	Lucy Madeira.
Manhattan College	New York City (Grand Boulevard and 131st St.)	Brother Jerome.
Manual Training High School	Brooklyn, N. Y.	Charles D. Larkins.
Maryland State Normal School	Baltimore, Md.	George Washington Ward, Ph.D.
Mercersburg Academy	Mercersburg, Pa.	William Mann Irvine, Ph.D.
Mohegan Lake School	Mohegan, N. Y.	Henry Waters. Albert E. Linder.
Montclair Military Academy	Montclair, N. J.	John G. Mac Vicar.
Montclair High School	Montclair, N. J.	H. W. Dutch.
Moravian College and Theological Seminary	Bethlehem, Pa.	Albert G. Rau, Ph.D., Dean.
Moravian Parochial School	Bethlehem, Pa.	Edward C. Roest.
Moravian Seminary and College for Women	Bethlehem, Pa.	Rev. J. H. Clewell, Ph.D.
Morris High School	New York City (Boston Road and 166th St.)	John H. Denbigh.
Morristown School	Morristown, N. J.	Francis C. Woodman.
Mt. Pleasant Academy	Ossining, N. Y.	C. F. Brusie.
Muhlenberg College	Allentown, Pa.	Rev. John A. W. Haas, D.D.
Neptune Township High School	Ocean Grove, N. J.	L. A. Doren.
Newark Academy	Newark, N. J.	Wilson Farrand.
New York University	New York City.	John H. MacCracken, LL.D.
Normal College	New York City (Park Av. and 68th St.)	George S. Davis, Ph.D.
Northeast Manual Training High School	Philadelphia, Pa.	Andrew J. Morrison, Ph.D.
Packer Institute	Brooklyn, N. Y.	Edward J. Goodwin, Ph.D.
Paterson High School	Paterson, N. J. (160 Market St.)	J. A. Reinhart.
Peddie Institute	Hightstown, N. J.	Roger W. Swetland.
Pennsylvania College	Gettysburg Pa.	W. A. Granville.
Pennsylvania State College	State College, Pa.	E. E. Sparks, Ph.D.
Perkiomen Seminary	Pennsburg, Pa.	Rev. O. S. Kriebel.
Pingry School	Elizabeth, N. J.	S. Archibald Smith.
Plainfield High School	Plainfield, N. J.	Lindsey Best.
Polytechnic Prep. School	Brooklyn, N. Y. (99 Livingston St.)	Alvan E. Duerr.
Princeton University	Princeton, N. J.	Hon. John Aikman Stewart.
(Misses) Rayson's School	New York City (164 W. 75th St.)	Amy Rayson.
Red Bank High School	Redbank, N. J.	S. V. Arrowsmith.
Riverview Academy	Poughkeepsie, N. Y.	Joseph B. Bisbee.
Rutgers College	New Brunswick, N. J.	W. H. S. Demarest, D.D.
Rutgers Preparatory Academy	New Brunswick, N. J.	Eliot R. Payson, Ph.D.
Rye Seminary	Rye, N. Y.	The Misses Stowe.
Sachs' Collegiate Institute	New York City (38 W. 59th St.)	Frederick Otto Koenig, J.U.D.
Sach's School for Girls	New York City (116 W. 59th St.)	Charles H. Liete.

INSTITUTION.	LOCATION.	HEAD OF INSTITUTION.
St. Agatha	New York City (553 West End Ave.)	Emma G. Sebring.
St. Agnes School	Albany, N. Y.	Catharine Regina Seabury.
St. John's College	Annapolis, Md.	Thomas Fell, LL.D.
St. Lawrence University	Canton, N. Y.	Rev. Almon Gunnison, D.D., LL.D.
St. Luke's School	Wayne, Pa.	Charles Henry Strout.
St. Paul's School	Garden City, L. I.	Walter R. Marsh.
St. Stephen's College	Annandale, N. Y.	Rev. Thomas R. Harris, D.D.
Shady Side Academy	Pittsburg, Pa. (5035 Castleman St.)	W. R. Crabbe, Ph.D.
Shippen School	Lancaster, Pa.	Florence Waterman.
Sidwells' Friends' School	Washington, D. C. (1811 I St. N. W.).	Thomas W. Sidwell.
State Model School	Trenton, N. J.	James M. Green, Ph.D., LL.D.
Staten Island Academy	New Brighton, N. Y.	Frederick E. Partington.
State Normal School	West Chester, Pa.	G. M. Phillips, Ph.D.
(Miss) Stuart's School	Pittsburgh, Pa. (4721 Fifth Ave.)	Ella Gordon Stuart.
Stuyvesant High School	New York City (345 E. 15th St.)	Ernest R. Von Nardroff, Ph.D.
Swarthmore College	Swarthmore, Pa.	Joseph Swain, LL.D.
Swarthmore High School	Swarthmore, Pa.	B. Holmes Wallace.
Swarthmore Preparatory School	Swarthmore, Pa.	Arthur H. Tomlinson.
Syracuse University	Syracuse, N. Y.	Rev. Jas. Roscoe Day, S.T.D., LL.D.
Temple College	Philadelphia, Pa.	Rev. R. H. Conwell.
Thurston Preparatory School	Pittsburgh, Pa. (Shady Av.)	Alice M. Thurston.
Tome School for Boys	Port Deposit, Md.	Thomas S. Baker, Ph.D.
Union College	Schenectady, N. Y.	Charles Alexander Richmond, D.D.
University of Maryland	Baltimore, Md.	Bernard Carter, LL.D.
University of Pennsylvania	Philadelphia, Pa.	Edgar F. Smith, Sc.D., LL.D.
University of Pittsburgh	Allegheny, Pa. (900 Lincoln Ave.)	Samuel B. McCormick, D.D., LL.D.
University of Rochester	Rochester, N. Y.	Rush Rhees, LL.D.
Univ. of the State of N. Y.	Albany, N. Y.	Augustus S. Downing, Ph.D.
Ursinus College	Collegeville, Pa.	A. Edwin Keigwin, D.D.
Vassar College	Poughkeepsie, N. Y.	James M. Taylor, D.D., LL.D.
Wadleigh High School	New York City (114th St. and 7th Av.)	John G. Wight, Ph.D.
Washington and Jefferson Academy	Washington, Pa.	James N. Rule.
Washington and Jefferson College	Washington, Pa.	James D. Moffatt, D.D.
Washington College	Chestertown, Md.	James W. Cain, LL.D.
Wells College	Aurora, N. Y.	Rev. Geo. Morgan Ward, D.D.
West Chester High School	West Chester, Pa.	Addison L. Jones.
Western High School	Baltimore, Md.	David E. Weglein.
Western Maryland College	Westminster, Md.	Rev. Thomas Hamilton Lewis, D.D.
Westtown Boarding School	Westtown Pa.	William F. Wickersham.
William Penn High School for Girls	Philadelphia (15th and Wallace Sts.)	W. D. Lewis.
Wilmington High School	Wilmington, Del.	A. Henry Berlin.
Wilson College	Chambersburg, Pa.	M. H. Reaser, Ph.D.
Woman's College	Frederick, Md.	Joseph H. Apple.
Wyoming Seminary	Kingston, Pa.	Rev. L. L. Sprague, D.D.
Yeates School	Lancaster, Pa.	Rev. Frederick Gardiner.
Yonkers High School	Yonkers, N. Y.	William A. Edwards.
York Collegiate Institute	York, Pa.	Rev. E. T. Jeffers, D.D., LL.D.

DELEGATES REGISTERED, 1910.

ALBRIGHT COLLEGE, *Myerstown, Pa.* Rev. J. F. Dunlap, President; H. F. Schlegel, Walter J. Dech.

BALDWIN SCHOOL, *Bryn Mawr, Pa.* Jane L. Brownell, Principal.

BALTIMORE POLYTECHNIC INSTITUTE, *Baltimore, Md.* James B. Arthur.

BERNARDS HIGH SCHOOL, *Bernardsville, N. J.* A. B. Yerger.

BETHLEHEM PREPARATORY SCHOOL, *Bethlehem, Pa.* H. A. Foering, Head Master; H. J. Prechtl, F. A. Johnson, M. E. Hammond.

BLAIR ACADEMY, *Blairstown, N. J.* Catharine McCamant.

CAMDEN HIGH SCHOOL, *Camden, N. J.* H. G. Good.

CATHOLIC UNIVERSITY OF AMERICA, *Washington, D. C.* Daniel W. Shea, Aubrey E. Landry.

CENTRAL HIGH SCHOOL, *Philadelphia, Pa.* Ellis A. Schnabel.

COLUMBIA UNIVERSITY, *New York City.* John Erskine, Thomas S. Fiske, Adam L. Jones.

CONWAY HALL, *Carlisle, Pa.* W. A. Hutchinson.

CORNELL UNIVERSITY, *Ithaca, N. Y.* G. P. Bristol, E. J. Bailey.

DELAWARE COLLEGE, *Newark, Del.* George A. Harter, President.

DICKINSON COLLEGE, *Carlisle, Pa.* John F. Mohler, W. W. Landis, George A. Crider.

EASTON HIGH SCHOOL, *Easton, Pa.* W. A. Jones, Principal; S. P. Uhler, Stephen G. Simpson, Susan R. Miller, George R. Miller, Pauline Cope, Mary E. Mansfield.

ETHICAL CULTURE SCHOOL, *New York City.* C. B. Walsh, Augustus Klock.

EAST ORANGE HIGH SCHOOL, *East Orange, N. J.* Charles W. Evans.

FRANKLIN AND MARSHALL ACADEMY, *Lancaster, Pa.* Edwin M. Hartman, Principal.

FRANKLIN AND MARSHALL COLLEGE, *Lancaster, Pa.* Rev. Henry H. Apple, President; John S. Stahr.

FRIENDS' CENTRAL SCHOOL, *Philadelphia.* W. A. Barrett, Principal; George L. McCracken, Charles W. White, Guy W. Chipman.

FRIENDS' SELECT SCHOOL, *Philadelphia, Pa.* James S. Hiatt, Superintendent; Mary Anna Jones.

GEORGE SCHOOL, *George School, Pa.* Joseph S. Walton, Principal; George A. Walton, Belle Vansant.

GEORGE WASHINGTON UNIVERSITY, *Washington, D. C.* H. L. Hodgkins, Dean.

GERMANTOWN FRIENDS' SCHOOL, *Germantown, Pa.* Stanley R. Yarnall, Principal; Francis N. Maxfield, Vice-Principal; Jane Shoemaker Jones.

GIRARD COLLEGE, *Philadelphia, Pa.* C. Addison Willis.

GIRLS' NORMAL SCHOOL, *Philadelphia, Pa.* S. W. Burmester.

HAVERFORD COLLEGE, *Haverford, Pa.* Isaac Sharpless, President.

HOBART COLLEGE, *Geneva, N. Y.* Arthur A. Bacon.

HOLMAN SCHOOL FOR GIRLS, *Philadelphia, Pa.* Harriet M. Brownell.

High School for Girls, *Philadelphia, Pa.* J. Eugene Baker, Principal; Elizabeth B. Albrecht, Mary Stuart Berry, C. Edna Bramble, Ida A. Keller, Edna E. Marley, Sarah P. Miller, Katharine E. Puncheon, Mary R. Scattergood, Elmira Loder, Evaline Young.

Jamaica High School, *Jamaica, N. Y.* Henry R. Linville.

Johns Hopkins University, *Baltimore, Md.* Edward H. Griffin, Dean.

Lafayette College, *Easton, Pa.* John M. Mecklin, J. H. Raschen, Ethelbert D. Warfield, President.

Lawrenceville School, *Lawrenceville, N. J.* Fletcher Durell.

Lerch Preparatory School, *Easton, Pa.* Charles H. Lerch.

Lehigh University, *South Bethlehem, Pa.* Henry S. Drinker, President; N. M. Emory, Vice-President; H. M. Fry, C. J. Goodwin, Robert W. Hall, J. F. Klein, W. L. Leighton, Charles K. Meschter, Robert P. More, J. H. Ogburn, P. M. Palmer, C. A. Pierle, William J. Robbins, Charles S. Fox, P. N. de Schweinitz, John L. Stewart, John E. Stocker, C. L. Thornburg, Leon D. Conkling, Rollin L. Charles.

Linden Hall Seminary, *Lititz, Pa.* Charles D. Krieder, Principal.

Mercersburg Academy, *Mercersburg, Pa.* James G. Miller.

Miss Hills' School, *Philadelphia, Pa.* Alice Hill Byrne, Florence Jackson, Associate Principal; Helen Tuxbury.

Montclair Academy, *Montclair, N. J.* W. H. Miller.

Moravian College, *Bethlehem, Pa.* Albert G. Rau, Dean; W. N. Schwarze.

Moravian Seminary, *Bethlehem, Pa.* J. H. Clewell, President; C. H. Wunderling, Emma B. Hoch.

Moravian Parochial School, *Bethlehem, Pa.* Edward C. Roest, Superintendent; M. H. Wunderling, Charles H. Rominger, Elizabeth W. Rondthaler.

Morris High School, *New York City.* John H. Denbigh, Principal.

Muhlenberg College, *Allentown, Pa.* C. C. Alexander, H. D. Bailey, Robert R. Fritsch.

Nazareth Hall, *Nazareth, Pa.* H. H. Hacker.

Newark Academy, *Newark, N. J.* Wilson Farrand, Head Master; C. F. Zerweck.

New York University, *New York City.* Archibald L. Bouton.

Pennsylvania College, *Gettysburg, Pa.* W. A. Granville, President.

Pennsylvania State College, *State College, Pa.* A. Howry Espenshade.

Perkasie High School, *Perkasie, Pa.* J. Warren Fritsch.

Pittsburg High School, *Pittsburg, Pa.* Edward Rynearson.

Rensselaer Polytechnic Institute, *Troy, N. Y.* Arthur M. Greene, Jr.

Rutgers College, *New Brunswick, N. J.* Louis Bevier, Robert W. Prentiss, Charles H. Whitman.

Shamokin High School, *Shamokin, Pa.* Katharine McC. Morris.

State Normal and Model School, *Trenton, N. J.* James M. Green, Principal; E. F. Carr, E. Moore, Eleanor Parmenter.

St. Johns' College, *Annapolis, Md.* Thomas Fell, President.

Syracuse University, *Syracuse, N. Y.* W. H. Metzler.

Tome Institute, *Port Deposit, Md.* Thomas S. Baker, Director; C. A. Ewing, Charles M. Stearns.

UNIVERSITY OF PENNSYLVANIA. George Egbert Fisher, Dean; H. B. Evans, George H. Hallett, Reese Davis James, Arthur H. Quinn.
UNIVERSITY OF PITTSBURGH, *Pittsburgh, Pa.* S. B. Linhart.
UNIVERSITY OF ROCHESTER, *Rochester, N. Y.* Arthur Sullivan Gale.
UNIVERSITY OF THE STATE OF NEW YORK, *Albany, N. Y.* Charles F. Whitlock.
VASSAR COLLEGE, *Poughkeepsie, N. Y.* E. B. Cowley.
WASHINGTON COLLEGE, *Chestertown, Md.* James W. Cain, President.
WASHINGTON AND JEFFERSON ACADEMY, *Washington, Pa.* C. C. Meyer.
WEST CHESTER NORMAL SCHOOL, *West Chester, Pa.* Harriet H. Baldwin.
WILLIAM PENN HIGH SCHOOL, *Philadelphia, Pa.* W. D. Lewis, Principal; Beulah A. Fenimore, Elizabeth Lodor, Florence H. Richards, Jonathan T. Rorer, Carolyn Wood Stretch.
WILMINGTON HIGH SCHOOL. A. H. Berlin, Principal.
WILSON COLLEGE, *Chambersburg, Pa.* Adelaide Bird, Clara Maud Syrret.
WOMAN'S COLLEGE, *Frederick, Md.* Lillian A. Brown.